

**FINAL
SITE HEALTH AND SAFETY PLAN**

Site: FUEL LINE CLOSURE
NAVAL STATION NEWPORT

Location: MIDDLETOWN, RHODE ISLAND

Prepared By: FOSTER WHEELER ENVIRONMENTAL CORPORATION

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Project Description: CLEANING AND CLOSURE OF FUEL PIPELINE


Delivery Order #: 0065

Waste Types: Liquid, Solid and Sludge
Characteristics: Toxic
Status: Active, Military
Background Review: Preliminary
Overall Hazard: Moderate

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APPROVALS

By their signature, the undersigned hereby certify that this SHSP has been reviewed and approved for use at the Pipeline Cleaning and Closure, Naval Station, Newport, Middletown, Rhode Island Site



DELIVERY ORDER MANAGER

5/11/06

DATE



PROGRAM HEALTH AND SAFETY MANAGER

5/11/06

DATE

SITE SUPERINTENDENT

DATE

SITE HEALTH AND SAFETY OFFICER

DATE

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1.0 INTRODUCTION

1.1 Purpose

This Site Health and Safety Plan (SHSP) addresses the health and safety practices that will be followed by all site workers participating in activities at the Fuel Line Cleaning and Closure located at the Naval Station Newport in Middletown, RI. This SHSP takes into account the specific hazards inherent to the cleaning and closure of the fuel line. It presents procedures to be followed by Foster Wheeler Environmental Corporation (FWENC), its subcontractors, and all other on-site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. Activities performed will comply with applicable parts of OSHA Regulations, 29 CFR Parts 1910 and 1926, USACOE EM 385-1-1, the Final (Master) Melville North Landfill Health and Safety Plan, dated May 18, 1999 and the Foster Wheeler Environmental Corporation Health and Safety Program. A copy of the FWENC Health and Safety Program and the referenced Master Site Health and Safety Plan will be maintained on site. Modifications to this SHSP may be made with the approval of the PHSM using the Field Change Request Form.

1.2 Scope

1.2.1 Objectives

The objective is the cleaning and closure of the main fuel pipeline from the North Pump House to Pier One. The closure process will involve the abatement of the asbestos insulation within the chambers. The fuel line will be cleaned, pressure tested, and isolated from the Tank Farms, Piers, and any other distribution lines. Upon the completion of the cleaning process the chambers will be demolished, soils below the chambers and adjacent to pipeline penetrations outside of the chambers will be sampled. All wastes generated will be disposed of and all affected areas will be restored.

1.2.2 Anticipated Tasks

The following major activities will be performed during the cleaning and closure:

- Mobilization and demobilization
- Asbestos abatement
- Pipeline cleaning and testing
- Soil sampling
- Chamber demolition and entry
- Removal of contaminated soils
- Site restoration

1.2.3 Mobilization

The following tasks will be conducted by Foster Wheeler during site mobilization: mobilize equipment and supplies, conduct utility survey, install soil erosion control measures, institute dust control

measures, establish temporary storage area, and install high visibility fencing for site control.

1.2.4 Asbestos Abatement

Prior to work within the concrete chambers, entry will be made and the chamber will be inspected for the presence of asbestos insulation. It is assumed that any insulation present contains asbestos. If asbestos insulation exists, it will be abated prior to any other activity associated with the closure of the fuel pipeline. Refer to Attachment 2 of the Work Plan for the Asbestos Abatement Plan.

Once the asbestos abatement has been completed, the Navy's third party independent contractor will perform clearance sampling to confirm that asbestos levels within the vault are at nonhazardous concentrations prior to entry. Inspection and sampling will be performed by RIDEM Certified /Licensed Asbestos Personnel. Asbestos testing will be performed by a RIDEM Certified Asbestos Laboratory.

1.2.5 Pipeline Cleaning and Testing

Temporary tanks with a 21,000-gallon storage capacity will be used to store recovered product and water awaiting transportation and disposal. Spill Guard containment cells will be placed under the storage tanks and spill control materials (absorbent pads and speedy-dry) will be stationed adjacent to the tanks for use in the event of an accidental release. These tanks will be piped together in series to allow for one established loading and off-loading area. Evertight fittings will attach to the tanks for the connection of vacuum hose for loading and off-loading.

An inspection of the pipeline will be performed prior to product removal to identify areas where product can be drained. Once these areas are located, authorized personnel will enter the vaults, through the manhole located on the vault covers, and place Evertight fittings onto the drain valves. These fittings will allow for the connection of a 2-inch and/or 3-inch 150-psi petroleum vacuum hose, which will be attached to 5,000 and 3,000-gallon vacuum trucks for product removal. Once the vacuum trucks are full the recovered product and water will be transferred to the storage tanks.

After the lines have been drained, vault covers will be removed, as necessary, to allow access to valve assemblies for removal and for the installation of pig launchers and receivers. Valve assemblies will be removed utilizing flange spreaders, chains, and a skid loader and/or backhoe. Spill pans will be placed under the valves to capture any residual products remaining within the pipeline. A vacuum truck will be on standby in the event there is more product remaining in the line than the pan can contain. Valve assemblies, which have been removed, will be cleaned by draining excess product into drip pans and hand wiping with oil absorbent pads. If necessary, a degreasing agent such as Simple Green will be used to remove excess materials. Once the valves have been removed, a pig will be placed into the pipeline and the launcher will be attached to the pipe. A compressor will be used to drive the pig through the pipeline using compressed air. Once the pig has reached the end of the line, a receiver will be installed to catch the pig along with the product being extracted, as they exit the pipeline. An Evertight fitting, with a 2-inch and/or 3-

inch petroleum vacuum attached to a vacuum truck will be used to transport the product being forced out of the line to the receiver. Recovered product will then be transferred from the vacuum truck to the temporary storage tanks

Upon completion of the cleaning, the pig, launchers and receiver will be removed from the pipeline and blind flanges (with pressure gauges) will be installed at the pipe ends. The pipeline section shall then be pressurized with air to 25 psi. All flanged fittings and valves along the section of pipe to be tested will be soap tested for leaks. Flanges will be tightened as required. Following check out, the line will be allowed to stand for 24 hours. Pressure gauges will be monitored for changes or pressure drops during the initial 2-hour period. Following completion, the line will be visually inspected at the end to determine if an additional cleaning is needed. Pressure readings will be recorded for the initial 2-hour period and at the completion of the 24-hour period. Records shall include the initial pressure readings, any pressure drops, and any leaks and corrective action taken. Once pressure testing has been completed, the blind flanges with pressure gauges will be removed and permanent blind flanges will be installed onto the open ends of the pipelines.

Additional spill control measures will be necessary on the Piers to protect against an accidental release of petroleum products. Curtain booms will be installed around the Pier and a spill trailer with an additional curtain boom, an 8" absorbent boom, bales of oil absorbent pads, a boat, and a motor will be staged at the pier to provide additional protective measures in the event of an accidental release. In the event of a release of any quantity of petroleum products into the surface water, immediate notification will be made by FWENC or the Navy to the Rhode Island Department of Environmental Management, Oil Pollution Response Office.

1.2.6 Soil Sampling

Soil samples will be collected from the areas outside of the chambers where the pipelines penetrate chambers' walls. The number and location of pipe penetrations will be determined by inspecting the interiors. A John Deere 710 rubber tire backhoe will be used to excavate and expose the pipelines for sampling purposes. All soils removed will be placed in a stockpile adjacent to the work area. Samples will then be collected from under the pipeline and adjacent to the chamber wall. One sample will also be collected from directly beneath the chamber floor slab where the concrete is broken to allow for future drainage of water. All soil samples shall be tested for TPH (both low density 418 and high density 8015), VOCs (EPA Method 8260), SVOCs (EPA Method 8270), and TAL Metals (EPA Method 6000s).

1.2.7 Chamber Demolition

There are a total of 49 chambers to be demolished throughout the length of the fuel pipeline. The complete demolition of the chambers will not begin until the portion of pipeline to be affected by the chamber demolition has been isolated, cleaned and pressure tested. The interiors of the chambers will be inspected for signs of contamination such as staining or the presence of oil. If a chamber is found to be contaminated the condition will be brought to the attention of the Navy and a decision as to the corrective action to be taken will be reached.

Chambers will have soil samples collected per section 1.2.6. Once soil samples have been collected, a John Deere 710 rubber tire backhoe with a hydraulic hammer attachment will be used to break the chamber tops and the walls to the first foot below the ground surface. The concrete floor will be broken to allow drainage of water. All broken concrete will be placed within the chamber and mixed with clean backfill material to minimize void. The remainder of the chamber will be backfilled following the procedure outlined in section 1.2. mulched.

1.2.8 Removal of Contaminated Soils

If contaminated soils are encountered adjacent to the chambers, the soils shall be excavated and removed. Based upon the available analytical data, hazardous and non-hazardous soils may be generated during the pipeline cleaning and closure. The majority of the excavated soil is anticipated to be non-hazardous. The soils on site shall be excavated and stock-piled based upon previous and newly obtained analytical results. The suspected hazardous soils shall be stock-piled in a separate location from the non-hazardous soils samples. All soils will be sampled and analyzed to determine the proper waste classification.

Based on the existing data, it appears the soils associated with the pipeline may contain concentrations of No. 2 oil and No. 6 oil which may result in a hazardous classification. This assumption is based upon the previous use of the pipeline.

The soils suspected to be hazardous shall be excavated, stock-piled and sampled for waste characterization prior to any other soils to ensure that the soils are removed from the site before 90-days to comply with federal and state regulations.

The potentially hazardous soils will be placed on double-line polyurethane (poly). Hay bales will be placed around the soil piles, and the poly will be placed up and around the hay bales to prevent run-off from the piles as well as prevent surface run-on. The piles will be covered with poly and anchored.

The area of excavation shall be delineated with stakes prior to excavation. Grading stakes shall also be used to determine the approximate depth of excavation below existing grade. The majority of the site shall be excavated to a depth of 1.5 feet below the existing grade. This depth is based on the available data depicting the soil concentrations greater than the Non-Residential Cleanup Criteria. Some areas may require excavation to a depth greater than 1.5 feet below grade.

1.2.9 Site Restoration

A John Deere 710 rubber tire backhoe with a hydraulic hammer attachment will be used to break chamber covers and walls to one foot below the ground surface. The concrete floor will be broken to allow drainage of water. All broken concrete will be placed within the chamber and mixed with clean backfill material to minimize void. The remainder of the chamber will be backfilled with 6-inch minus imported clean soil. The backfill will be compacted with the backhoe bucket during placement. As a final restoration measure, 4-inches of topsoil will be placed on the

surface, and the area will be seeded and mulched

1.3 Application

The SHSP applies to all personnel involved in the above tasks who wish to gain access to active work areas, including but not limited to:

- Client representatives
- Federal, state or local representatives
- Foster Wheeler Environmental employees and subcontractors
- Sub-contractors, if any, will provide activity hazard analysis and discuss them with Foster Wheeler Environmental prior to mobilization

1.4 Summary of Major Risks

- Operation of heavy equipment
- Electrocutation
- Excavation (overhead utilities)
- Exposure to asbestos
- Exposure to chemical contaminated soils
- Confined spaces
- Trenching
- Hot Work

2.0 PROJECT ORGANIZATION

Reference the Master Site HASP for specific duties and responsibilities. Names and positions for key project personnel are defined below.

Delivery Order Manager (DOM)-Carl Tippmann

Project Health and Safety Manager (PHSM)-Grey Coppi, CIH

Site Superintendent – Joshua Holden

Site Health and Safety Officer – Joshua Holden

Site Personnel - Craft employees

Site Personnel - Subcontractor employees

3.0 BACKGROUND AND SITE DESCRIPTION

3.1 Location

The fuel line is located at the Naval Station Newport, Newport Rhode Island (Refer to Figure 1 in the work plan.) A large portion of fuel pipeline runs along the eastern side of Burma Road. The line runs through the towns of Portsmouth and Middletown, Rhode Island (Refer to Figure 2 in the work plan.) A section of fuel line in the Defense Energy Support Center is in a concrete pipe chase with the remainder direct buried. The depth of the buried pipeline ranges from 4 to 6 feet.

below the existing grade. At the Pier locations, the fuel line is suspended under the Pier from hangers.

3.2 Background and Site Description

The 6 miles of inactive fuel pipeline that runs along Burma Road from the Defense Energy Support Center to the Navy's Pier 1 had been utilized to transfer No. 2 oil and No. 6 oil. The section to be cleaned and closed is the main line from the North Booster Pump House, Building No. 58, to the supply lines for Pier No. 1 and Pier No. 2. During the closure process the main line will be isolated from the Tank Farms, Piers, and other distribution lines.

The fuel line starts as 12-inch pipeline at the Building 58 and increases in size to 16-inches at Chamber C18. The 16-inch pipeline runs to a position just south of Tank Farm 5 and increases to a 24-inch pipeline. The 24-inch pipeline reduces in size to 16-inch just prior to entering Building No. 73. Building No. 73 is the pumping station distributing fuel to Pier 1 and Pier 2. The pipelines on the Pier's range in size from 4-inch to 18-inch.

There are a total of 49 concrete chambers to be demolished during the closure process. These chambers are partially buried with ladder access built into the sidewalls. A typical chamber is approximately 12 wide by 12 feet long by 6 feet tall. The purpose of the chambers is to provide access to valves, expansion joints, and reducers associated with the fuel pipeline. Some of the chambers have steam lines that pass through them. These steam lines are insulated with asbestos.

4.0 POTENTIAL HAZARDS

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered during the tasks specified under section 1.2.

4.1 Properties of Chemical Contamination

Based on previous investigations, the piping is known to potentially contain asbestos. The soils and piping may be contaminated with No. 2 oil and No. 6 oil.

No studies are available on the acute (short-term) effects of asbestos in animals or humans. Symptoms of chronic asbestos exposure via inhalation can result in asbestosis. Asbestosis is characterized by shortness of breath and cough and may lead to severe impairment of respiratory function and ultimately death. Other effects from chronic inhalation exposure to asbestos include an accumulation of scar-like tissue in the membranes that surround the lung, pulmonary hypertension, and immunological effects. The U.S. Environmental Protection Agency (EPA) has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for asbestos. No studies are available on the reproductive or developmental effects of asbestos via inhalation, and oral studies in animals have not reported any reproductive or developmental effects. Cancer is a major concern from asbestos exposure, as inhalation exposure can cause lung cancer and mesothelioma (a rare cancer of the thin membranes lining the abdominal cavity and surrounding internal organs), and possibly gastrointestinal cancers in humans.

Symptoms of acute fuel oil exposure via ingestion can result in GI tract irritation, nausea, vomiting and diarrhea. Inhalation of fuel oil vapors may cause respiratory tract irritation, headache or dizziness. A small amount of fuel oil may cause chemical pneumonitis, if aspirated into the lungs. If the eyes are exposed, eye irritation may result. Chronic exposure may cause dermatitis, eye irritation (burning and redness), headaches, nausea, weakness, sedation and unconsciousness.

4.2 Physical Hazards

Most physical safety hazards are discussed in the Activity Hazard Analyses (AHA) in Appendix A for the different phases of the project and will include confined space entry (App C) into the chambers. Heat stress prevention (App D) will be implemented per FWENC EHS 4-6. Reference the Master Site Health and Safety Plan, Section 4.3, for physical hazard descriptions.

4.3 Biological Hazards

During the course of the project, there is a potential for workers to come into contact with biological hazards such as animals, insects and plants. Reference the Master Health and Safety Plan for control measures for biological hazards.

Table 4-1

Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Routes of Exposure	Symptoms of Exposure	Target Organs	Physical Properties
Asbestos	1332-21-4	2 fibers/cc	0.2 fibers/cc	Inhalation Ingestion Skin Contact	Acute Irritates eyes, skin, respiratory tract Chronic Asbestosis, restricted pulm function, mesothelioma, GI cancer.	Resp sys, eyes	White or greenish (chrysotile), blue (crocidolite), or gray-green (amosite) fibrous, odorless solids. VP: 0.00001 mm
Fuel Oil # 2	68476-34-6	400 ppm (Petr. Dist.)	400 ppm (Petr. Dist.)	Inhalation Ingestion Skin Contact	Acute Irritates eyes, skin, respiratory tract Nausea, vomiting, CNS. Chemical pneumonitis if aspirated Chronic Dermatitis, eye irritation	Eyes, skin, CNS, resp sys, GI tract.	Clear or amber liquid with a hydrocarbon odor BP. 350F, 177C VP (MM Hg/70 F): 1-10 MMHG Vapor Density (Air=1) 4-5
Fuel Oil # 6	68553-00-4	400 ppm (Petr. Dist.)	400 ppm (Petr. Dist.)	Inhalation Ingestion Skin Contact	Acute Irritates eyes, skin, respiratory tract Nausea, vomiting, CNS Chemical pneumonitis if aspirated. Chronic Dermatitis, eye irritation.	Eyes, skin, CNS, resp sys, GI tract	Black viscous liquid, petroleum oil odor. BP. 400F, 204C VP, pure (mm Hg/70 F) negligible. Vapor Density (Air=1) >1 Flash Point: 140F, 60C

5.0 ACTIVITY HAZARD ANALYSES

The Activity Hazard Analysis is a systematic way of identifying the potential health and safety hazards associated with major phases of work on the project and the methods to avoid, mitigate and control these hazards. The AHAs follow the guidance of the Foster Wheeler Environmental Corporate Program EHS 3-5. AHAs will be developed for all activities as necessary, prior to start-up. The AHAs will be used to train workers in proper safety procedures.

AHAs are included in Appendix B of this SHSP. AHAs have been developed for the following tasks

- Mobilization and demobilization
- Asbestos abatement
- Pipeline cleaning and testing
- Soil sampling
- Chamber demolition
- Removal of contaminated soils
- Site restoration

6.0 PERSONAL PROTECTIVE EQUIPMENT

The personal protective equipment (PPE) detailed in the SHSP represents the hazard analysis and PPE selection required by 29 CFR 1910.132. For the purposes of PPE selection, the PHSM and SHSO are considered competent persons. The signatures contained in the approval section of the SHSP constitute certification of the hazard assessment. For activities not detailed below, the SHSO will conduct a hazard assessment and select the PPE using the appropriate form and will certify the assessment by signing the form. PPE selection will be made in consultation with the PHSM. The task-specific level of PPE required for each task is described in Table 6-1.

**TABLE 6-1
PERSONAL PROTECTIVE EQUIPMENT SELECTION**

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Mobilization							
Mobilize equipment and supplies	HH	SG	STB	LWG	WC	EP as needed	Level D
Conduct utility survey	HH	SG	STB	LWG	WC	EP as needed	Level D
Install soil erosion control measures	HH	SG	STB	LWG	WC	EP as needed	Level D
Install high visibility fence for site control	HH	SG	STB	LWG	WC	EP as needed	Level D
Asbestos abatement							
Assemble containment	HH	SG	STB	LWG, Sur	WC, tyvek	EP	Level D
Asbestos removal and disposal	HH	SG	STB, OB	LWG, Sur	WC, tyvek	EP	Level C, minimum
Containment disposal	HH	SG	STB	LWG	WC, tyvek	EP	Level C
Pipeline cleaning and testing							
Valve removal	HH	SG	STB	LWG	WC	EP	Level D
Locate and excavate pipe reducers	HH	SG	STB	LWG	WC	EP	Level D
Assemble line cleaning apparatus	HH	SG	STB	LWG	WC	EP	Level D
Clean line	HH	SG	STB	LWG	WC, tyvek	EP	Level D, C or B
Collect and dispose of fluids	HH	SG	STB	LWG	WC, tyvek	EP	Level D
Decontaminate chamber	HH	SG	STB	LWG	WC, poly	EP	Level D
Pressure test line	HH	SG	STB	LWG	WC	EP	Level D
Cut pipe and install compression fitting	HH	Welding glasses	STB	Welding gloves	WC	EP	Level D

**TABLE 6-1
PERSONAL PROTECTIVE EQUIPMENT SELECTION**

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Soil Sampling							
Excavate soil at pipe-chamber connections	HH	SG	STB	LWG	WC	EP	Level D
Sample soil	HH	SG	STB	LWG	WC	EP	Level D
Backfill excavated areas with common fill	HH	SG	STB	LWG	WC	EP	Level D
Chamber Demolition							
Demolish concrete chambers	HH	SG	STB	LWG	WC	EP	Level D
Backfill excavated areas with common fill	HH	SG	STB	LWG	WC	EP	Level D
Compact areas	HH	SG	STB	LWG	WC	EP as needed	Level D
Place top soil	HH	SG	STB	LWG	WC	EP as needed	Level D
Hydroseed areas	HH	SG	STB	LWG	WC	EP as needed	Level D
Removal of Contaminated Soils							
Excavate soil, if necessary	HH	SG	STB, OB	LWG, sur	WC, tyvek	EP as needed	Level D
Stockpile soil	HH	SG	STB, OB	LWG, sur	WC, tyvek	EP as needed	Level D
Collect waste classification samples	HH	SG	STB, OB	LWG, sur	WC, tyvek as needed	EP as needed	Level D
Collect post-excavation samples	HH	SG	STB, OB	LWG, sur	WC, tyvek as needed	EP as needed	Level D
Backfill excavated areas with common fill	HH	SG	STB	LWG	WC	EP as needed	Level D
Decontaminate equipment	HH	SG, PFS	STB, OB	Nit. Sur	WC, poly	EP as needed	Level D

TABLE 6-1
PERSONAL PROTECTIVE EQUIPMENT SELECTION

HEAD PROTECTION

HH = Hard Hat

HEARING PROTECTION

EP = ear plugs

HAND PROTECTION

LWG = Leather work gloves

Nit = Nitrile

Sur = Surgical

EYE/FACE PROTECTION

Gog = Splash Proof goggles

PFS =Plastic Face shield

SG = ANSI approved safety glasses with side shields

BODY PROTECTION

Tyvek = Uncoated paper Tyvek coveralls

Poly = Polyethylene coated tyvek coveralls

WC = Work Clothes

FOOT PROTECTION

OB = Overboot

Poly = polyethylene coated boot

Rub = rubber slush boots

STB = Leather work boots with steel toe.

RESPIRATORY PROTECTION

Level D = No respiratory protection need

Level C = Full face air purifying respirator Organic Vapor/P100 cartridge

6.1 Respirator Cartridge Change-out Schedule

A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is as follows

- Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first.
- If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short of time period they were used the day before.

The schedule was developed based on the following scientific information and assumptions

- Analytical data that is available regarding site contaminants,
- Using the Rule of Thumb provided by the AIHA,
- All of the chemicals have boiling points greater than 70° C,
- Total airborne concentration of contaminants is anticipated to be less than 200 ppm,
- The humidity is expected to be less than 85%; and
- Desorption of the contaminants (including those with poor warning properties) after partial use of the chemical cartridge can occur after a short period (hours) without use (e.g. overnight) and result in a non-use exposure

The following is a partial list of factors that may affect the usable cartridge service life and/or the degree of respiratory protection attainable under actual workplace conditions. These factors have been considered when developing the cartridge change-out schedule.

- Type of contaminant(s)
- Contaminant concentration
- Relative humidity
- Breathing rate
- Temperature
- Changes in contaminant concentration, humidity, breathing rate and temperature
- Mixtures of contaminants
- Accuracy in the determination of the conditions
- The contaminant concentration in the workplace can vary greatly. Consideration must be given to the quality of the estimate of the workplace concentration
- Storage conditions between multiple uses of the same respirator cartridges. It is recommended that the chemical cartridges be replaced after each work shift. Contaminants adsorbed on a cartridge can migrate through the carbon bed without airflow.

- Age of the cartridge
- Condition of the cartridge and respirator
- Respirator and cartridge selection Respirator fit
- Respirator assembly, operation, and maintenance
- User training, experience and medical fitness
- Warning properties of the contaminant
- The quality of the warning properties should be considered when establishing the chemical cartridge change schedule Good warning properties may provide a secondary or back-up indication for cartridge change-out.

7.0 AIR MONITORING

The following sections contain information describing the types, frequency and location of real time and integrated air monitoring

7.1 Real-Time Air Monitoring

Based on real time readings and site conditions, the SHSO or designee may increase/decrease the frequency at which the readings are taken using professional judgment A Flame-ionization Detector (FID) will be used to monitor for volatile organic compounds A Combustible Gas Indicator (CGI)/Oxygen Detector (O₂) will be used for air monitoring during confined space entries Table 7-1 provides the real-time air monitoring action levels Table 7-2 provides the frequency and location of real-time air monitoring

Real-time air monitoring results for on-site activities will be reviewed with craft labor periodically by the SHSO in site daily health and safety briefings

Table 7-1
Real Time Air Monitoring Action Levels

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action	Reason
FID	Breathing Zone	0 to 25 ppm	No respiratory protection required	TLV/PEL is 400ppm
		25 ppm – 250 ppm	Upgrade to Level C PPE.	TLV/PEL is 400ppm
		>250 ppm	Cease activities, proceed to rally point in clean area, contact PM & PESM for further instructions	TLV/PEL is 400ppm
CGI	Breathing Zone	1% LEL < Conc. < 10% LEL	Investigate possible causes, use caution during procedures	Increasing potential for ignition of vapors
		Conc > 10 LEL	Stop work; withdraw from work area, notify PESM	Potential for ignition of vapors
O ₂ meter	Breathing Zone	< 19.5% O ₂	Stop work, withdraw from work area, notify PESM	Low oxygen
		> 22% O ₂	Stop work, withdraw from work area; notify PESM.	Oxygen enriched atmosphere. explosion hazard

7.2 Frequency and Location of Real-Time Air Monitoring

Table 7-2 provides the frequency and location of real-time air monitoring

Table 7-2
Frequency and Location of Real Time Air Monitoring

ACTIVITY	AIR MONITORING INSTRUMENT	FREQUENCY AND LOCATION
Confined Space Entry into chambers	FID/CGI/O ₂	Before entry, and continuously during entry in the breathing zone
Pipe Cleaning Soil Excavation	FID	Every 30 minutes in the breathing zone

7.3 Integrated Air Monitoring

Integrated air monitoring will not be conducted during this work activity.

7.4 Data Quality Assurance

Reference the Master Site Health and Safety Plan

8.0 ZONES, PROTECTION AND COMMUNICATION

Reference the Master Health and Safety Plan.

9.0 MEDICAL SURVEILLANCE PROCEDURES

Reference the Master Health and Safety Plan

10.0 SAFETY CONSIDERATIONS

Reference the Master Health and Safety Plan

11.0 WASTE DISPOSAL PROCEDURES

Reference the Master Health and Safety Plan

12.0 EMERGENCY RESPONSE PLAN

Reference the Master Health and Safety Plan

13.0 TRAINING

Reference the Master Health and Safety Plan

14.0 LOGS, REPORTS AND RECORD KEEPING

Reference the Master Health and Safety Plan

Each field team member shall sign this section after site-specific training is completed and before being permitted to work on site. I have read, or have been informed of, the Site-Specific Health and Safety Plan for Pipeline Cleaning and Closure, Naval Station, Newport, Middletown, Rhode Island Site and understand the information presented. I will comply with the provisions contained therein

[illegible]

16.0 REFERENCES

American Conference of Governmental Industrial Hygienists, Inc , 1992, Documentation of the Threshold Limit Values and Biological Exposure Indices; 6th Ed., ACGIH, Cincinnati, Ohio

American Conference of Governmental Industrial Hygienists, Inc., 1987, Guidelines For The Selection of Chemical Protective Clothing; Third Edition, ACGIH, Cincinnati, Ohio, February 1987

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NIOSH/OSHA/USCG/EPA, 1985, Occupational Safety and Health, Guidance Manual For Hazardous Waste Site Activities, October 1985.

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U S Army Corps of Engineers, 1996, Safety and Health Requirements Manual, EM 385-1-1

U S Department of Labor, Occupational Safety and Health Administration, 1989, 29 CFR Part 1910 Hazardous Waste Operations and Emergency Response, draft rule, March 6, 1989, Construction Industry Standards, 29 CFR 1926, and General Industry Standards, 29 CFR 1910

U.S Environmental Protection Agency, Standard Operating Safety Guides, July 1988

U S Environmental Protection Agency, no date, Response Safety Decision-Making, Course Manual, Office of Emergency and Remedial Response, Hazardous Response Support Division .

APPENDIX A

ACTIVITY HAZARD ANALYSES

ACTIVITY HAZARD ANALYSIS

Project <u>Pipeline Cleaning and Closure</u> Activity <u>Mobilization</u>		Location: <u>Naval Station Newport, Middletown, RI</u>	
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS	
1 Mobilize equipment and supplies (Hazards and controls 1 - 8 apply)	1 Back Injuries	1 Site personnel will be instructed on proper lifting techniques, mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.	
2 Conduct utility survey (Hazards and controls 2, 3, 5, 6,9 apply)	2 Slips/Trips/Falls	2 Maintain work areas safe and orderly; unloading areas should be on even terrain, mark and repair if possible tripping hazards	
3 Install soil erosion control measures (Hazards and controls 1 - 8 apply)	3. Dropped Objects	3 Steel toe boots meeting ANSI Standard Z41 will be worn.	
4 Layout excavation and work areas (Hazards and controls 1 - 8 apply)	4 Noise	4 Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); SHSO will determine the need for hearing protection, all equipment will be equipped with manufacturer's required mufflers	
5 Install high visibility fencing for site control (Hazards and controls 1 - 8 apply)	5 Exposure to temperature extremes	5 Controls will be implemented to minimize exposure to temperature extremes including work rest regimens, warm or cool rest areas, protective clothing, and minimize exposure time	
	6 Eye Injuries	6 Safety glasses meeting ANSI Standard Z87 will be worn.	
	7 Pinch/Cut/Smash	7 Cut resistant kevlar work gloves will be worn when dealing with sharp objects; all hand and power tools will be maintained in safe condition; guards will be kept in place while using hand and power tools	
	8 Hand and Power Tools	8 Daily inspections will be performed; remove broken or damaged tools from service; use the tool for its intended purpose, and use in accordance with manufacturer's instructions GFCI's with 'no-voltage' release feature will be used	
	9. Encountering Utilities	9 All overhead utilities will be identified prior to equipment operations, no equipment or personnel closer than 10 feet to energized electrical lines or unprotected/ unshielded circuits or similar structures	
EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
1 Heavy Equipment 2 Appropriate PPE 3 First Aid Kits 4 Portable Eyewash 5 Fire Extinguishers 6 Hand and Power Tools 7 Hay bales and silt fence	1 Inspections will be performed on equipment prior to each use 2 Inspections will be performed on PPE prior to each use 3 Monthly inspections will be performed on first aid kits 4 Portable eye wash will be inspected monthly 5. Monthly inspections will be performed on fire extinguishers 6 Hand and power tools will be inspected before each use	1 Personnel have read and comply with SHSP 2 Site specific training 3 Qualified operators will be used for equipment operation 4 At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training 5 Instruct personnel on proper use of fire extinguishers 6 Hand and power tools will be used according to manufacturer's directions	

ACTIVITY HAZARD ANALYSIS

Project <u>Pipeline Cleaning and Closure</u>			Location <u>Naval Station Newport, Middletown, RI</u>		
Activity: <u>Asbestos Abatement</u> [work will be conducted by qualified subcontractor]					
MAJOR STEPS		POTENTIAL HAZARDS		PROTECTIVE MEASURES/CONTROLS	
1	Assemble containment (Hazards and controls 1, 2, 4 - 9, apply)	1.	Back Injuries	1	Site personnel will be instructed on proper lifting techniques, mechanical devices should be used to reduce manual handling of materials, team lifting should be utilized if mechanical devices are not available
2	Asbestos removal and disposal (Hazards and controls 1 - 12 apply)	2	Slips/Trips/Falls	2	Maintain work areas safe and orderly, unloading areas should be on even terrain, mark and repair if possible tripping hazards. A full body harness and lanyard will be used when working in a manlift
3	Containment disposal (Hazards and controls 1 - 12 apply)	3	Vehicular Traffic	3	Spotters will be used when backing up trucks and heavy equipment and when moving equipment
		4	Overhead Hazards	4	Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. All ground personnel will stay clear of suspended loads. All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. All overhead hazards will be identified prior to commencing work operations.
		5	Dropped Objects	5	Steel toe boots meeting ANSI Standard Z41 will be worn.
		6.	Noise	6	Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs), SHSO will determine the need for hearing protection, all equipment will be equipped with manufacturer's required mufflers
		7.	Temperature extremes	7	Controls will be implemented to minimize exposure to temperature extremes including work rest regimens, warm or cool rest areas, protective clothing, and minimize exposure time
		8	Eye Injuries	8	Safety glasses meeting ANSI Standard Z87 will be worn
		9	Hand and Power Tools	9	Daily inspections will be performed, remove broken or damaged tools from service, use the tool for its intended purpose, and use in accordance with manufacturer's instructions. GFCI's with 'no-voltage' release feature will be used
		10	Fire	10	ABC type fire extinguishers shall be readily available, no smoking in work area, all equipment will be turned off during refueling, gasoline containers will be grounded to prevent build up of static electricity
		11.	Pinch/Cut/Smash	11	Cut resistant kevlar work gloves will be worn when dealing with sharp objects, all hand and power tools will be maintained in safe condition, guards will be kept in place while using hand and power tools
		12	Confined Space Entry(oxygen deprivation, LEL, toxics	12	All confined space entry activities will be performed in accordance with 29 CFR 1910.146 and Foster Wheeler Environmental procedure 6-2. Additional requirements for confined space entries can be found in the AHA for Confined Space Entries.
		13	Exposure to ACM	13	PPE as per Table 6-1 will be used
EQUIPMENT USED		INSPECTION REQUIREMENTS		TRAINING REQUIREMENTS	
1	Appropriate PPE	1	Inspections will be performed on equipment prior to each use	1	Personnel have read and comply with SHSP
2	First Aid Kits	2	Inspections will be performed on PPE prior to each use	2	Site specific training
3	Portable Eyewash	3	Monthly inspections will be performed on first aid kits	3	Qualified operators will be used for equipment operation
4	Fire Extinguishers	4	Portable eye wash will be inspected monthly	4	At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training
5	Hand and Power Tools	5	Monthly inspections will be performed on fire extinguishers	5	Instruct personnel on proper use of fire extinguishers
6	Heavy Equipment	7	Hand and power tools will be inspected before each use		

Project <u>Pipeline Cleaning and Closure</u>		Location <u>Naval Station Newport, Middletown, RI</u>
Activity <u>Asbestos Abatement</u> [work will be conducted by qualified subcontractor]		
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	8 Heavy equipment will be inspected prior to each day's use	6 Hand and power tools will be used according to manufacturer's directions

ACTIVITY HAZARD ANALYSIS

Project <u>Pipeline Cleaning and Closure</u>		Location <u>Naval Station Newport, Middletown, RI</u>
Activity <u>Pipeline Cleaning and Testing [work will be conducted by qualified subcontractor]</u>		
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1 Valve removal (Hazards and controls 1 – 14 apply)	1. Back Injuries	1 Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available
2. Locate and excavate pipe reducers (Hazards and controls 1 – 14 apply)	2 Slips/Trips/Falls	2 Maintain work areas safe and orderly; unloading areas should be on even terrain, mark and repair if possible tripping hazards
3 Assemble line cleaning apparatus (Hazards and controls 1 – 14 apply)	3. Vehicular Traffic	3 Spotters will be used when backing up trucks and heavy equipment and when moving equipment
4 Clean line (Hazards and controls 1 – 15 apply)	4. Overhead Hazards	4 Personnel will be required to wear hard hats that meet ANSI Standard Z89.1 All ground personnel will stay clear of suspended loads All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. All overhead hazards will be identified prior to commencing work operations.
5 Collect and dispose of fluids (Hazards and controls 1 – 14 apply)	5. Dropped Objects	5. Steel toe boots meeting ANSI Standard Z41 will be worn
6 Decontaminate chamber (Hazards and controls 1 – 15 apply)	6. Noise	6 Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs), SHSO will determine the need for hearing protection, all equipment will be equipped with manufacturer's required mufflers
7 Pressure test line (Hazards and controls 1 – 14 apply)	7 Temperature extremes	7 Controls will be implemented to minimize exposure to temperature extremes including work rest regimens, warm or cool rest areas, protective clothing, and minimize exposure time
8 Cut pipe and install compression fitting (Hazards and controls 1 – 13 apply)	8 Eye Injuries	8 Safety glasses meeting ANSI Standard Z87 will be worn
	9 Heavy Equipment (overhead hazards, spills, struck by or against)	9 Equipment will have seat belts; operators shall wear seat belts when operating equipment. Do not operate equipment on grades that exceed manufacturer's recommendations Equipment will have guards, canopies or grills to protect from flying objects Ground personnel will stay clear of all suspended loads Spill and absorbent materials will be readily available Drip pans, polyethylene sheeting or other means will be used for secondary containment. Ground personnel will stay out of the swing radius Eye contact with operators will be made before approaching equipment. Equipment will not be approached on blind sides All equipment will be equipped with backup alarms
	10 Fire from hot cutting	10 ABC type fire extinguishers shall be readily available, no smoking in work area, all equipment will be turned off during refueling, gasoline containers will be grounded/bonded to prevent build up of static electricity Institute hot work permit program move combustibles 35 feet away or cover with flame resistant tarp
	11 Pinch/Cut/Smash	11 Cut resistant kevlar work gloves will be worn when dealing with sharp objects, all hand and power tools will be maintained in safe condition, guards will be kept in place while using hand and power tools Safe storage/use /handling of gas cylinders
	12 Excavation and Trenching	12 All trenching and excavation activities will be conducted in accordance with 29 CFR 1926. Subpart P and EHS 6-3 Excavations and trenches must be inspected daily by a competent person Atmospheric testing must be done prior to entry for trenches or excavations 4 feet deep or greater A protective system must be used when an excavation or trench is 5 feet deep or greater or when depth is less than 5 feet and inspection by a competent person reveals conditions that may result in cave-ins Travel distance between ladders must be no more than 25 linear feet

Project <u>Pipeline Cleaning and Closure</u>		Location <u>Naval Station Newport, Middletown, RI</u>
Activity <u>Pipeline Cleaning and Testing</u> [work will be conducted by qualified subcontractor]		
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	13 Hand and Power Tools	13 Daily inspections will be performed, remove broken or damaged tools from service, use the tool for its intended purpose, and use in accordance with manufacturer's instructions. Use no voltage release gfcis
	14 Chemical exposure to fuel oils	14 Perform air monitoring, wear appropriate ppe
	15 Confined Space Entry	15 All confined space entry activities will be performed in accordance with 29 CFR 1910.146 and Foster Wheeler Environmental procedure 6-2. Additional requirements for confined space entries can be found in the AHA for Confined Space Entries
EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1 Heavy Equipment 2 Appropriate PPE 3 First Aid Kits 4 Portable Eyewash 5 Fire Extinguishers 6 Hand and Power Tools 7 Air monitoring equipment	1 Inspections will be performed on equipment prior to each use 2 Inspections will be performed on PPE prior to each use 3 Monthly inspections will be performed on first aid kits 4 Portable eye wash will be inspected monthly 5 Monthly inspections will be performed on fire extinguishers 6 Hand and power tools will be inspected before each use 7 Pre and post calibrate	1 Personnel have read and comply with SHSP 2 Site specific training 3 Qualified operators will be used for equipment operation 4 At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training 5 Instruct personnel on proper use of fire extinguishers 6 Hand and power tools will be used according to manufacturer's directions 7 Performed by trained ESS

ACTIVITY HAZARD ANALYSIS

Project <u>Pipeline Cleaning and Closure</u> Activity <u>Subsurface Soil Sampling</u>		Location: <u>Naval Station Newport, Middletown, RI</u>
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1 Excavate soil at pipe chambers (Hazards and controls 1 - 11 apply)	1. Back Injuries	1 Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available
2 Sample soil (Hazards and controls 1 - 11 apply)	2 Slips/Trips/Falls	2 Maintain work areas safe and orderly; unloading areas should be on even terrain; mark and repair if possible tripping hazards, be aware when walking on/working in soft material.
3 Backfill excavated areas with common fill (Hazards and controls 1 - 11 apply)	3 Dropped Objects	3 Steel toe boots meeting ANSI Standard Z41 will be worn.
	4 Noise	4 Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); SHSO will determine the need for hearing protection, all equipment will be equipped with manufacturer's required mufflers
	5. Exposure to temperature extremes	5 Controls will be implemented to minimize exposure to temperature extremes including work rest regimens, warm or cool rest areas, protective clothing, and minimize exposure time
	6 Eye Injuries	6 Safety glasses meeting ANSI Standard Z87 will be worn
	7 Pinch/Cut/Smash	7 Cut resistant kevlar work gloves will be worn when dealing with sharp objects; all hand and power tools will be maintained in safe condition, guards will be kept in place while using hand and power tools
	8. Hand and Power Tools	8 Daily inspections will be performed, remove broken or damaged tools from service; use the tool for its intended purpose, and use in accordance with manufacturer's instructions
	9 Chemical Exposure	9 Appropriate protective clothing per Table 6-1 will be worn during site activities, air monitoring will be conducted, skin will be rinsed with water if contact with hazardous material occurs; a portable eye wash station will be located by work area
	10 Heavy Equipment	10 Equipment will have seat belts, operators shall wear seat belts when operating equipment. Do not operate equipment on grades that exceed manufacturer's recommendations. Equipment will have guards, canopies or grills to protect from flying objects. Ground personnel will stay clear of all suspended loads. Spill and absorbent materials will be readily available. Drip pans, polyethylene sheeting or other means will be used for secondary containment. Ground personnel will stay out of the swing radius. Eye contact with operators will be made before approaching equipment. Equipment will not be approached on blind sides. All equipment will be equipped with backup alarms
	11 Excavation and Trenching	11 All trenching and excavation activities will be conducted in accordance with 29 CFR 1926. Subpart P and EHS 6-3. Excavations and trenches must be inspected daily by a competent person. Atmospheric testing must be done prior to entry for trenches or excavations 4 feet deep or greater. A protective system must be used when an excavation or trench is 5 feet deep or greater or when depth is less than 5 feet and inspection by a competent person reveals conditions that may result in cave-ins. Travel distance between ladders must be no more than 25 linear feet
EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1 Appropriate PPE 2 First Aid Kits 3 Portable Eyewash	1 Inspections will be performed on equipment prior to each use 2 Inspections will be performed on PPE prior to each use 3 Monthly inspections will be performed on first aid kits	1 Personnel have read and comply with SHSP 2 Site specific training 3 Qualified operators will be used for equipment operation

Project <u>Pipeline Cleaning and Closure</u>		Location. <u>Naval Station Newport, Middletown, RI</u>
Activity <u>Subsurface Soil Sampling</u>		
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
4 Fire Extinguishers	4 Portable eye wash will be inspected monthly	4 At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training
5 Hand Tools	5 Monthly inspections will be performed on fire extinguishers	5 Instruct personnel on proper use of fire extinguishers
6 Air Monitoring Equipment	7 Hand tools will be inspected before each use	6 Hand tools will be used according to manufacturer's directions
	8 Air monitoring equipment will be pre and post calibrated according to manufacturers recommendations	7 Only qualified individuals will use air monitoring equipment

ACTIVITY HAZARD ANALYSIS

Project <u>Pipeline Cleaning and Closure</u> Activity <u>Chamber Demolition</u>		Location <u>Naval Station Newport, Middletown, RI</u>	
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS	
1 Demolish concrete chambers using backhoe and hydraulic hammer (Hazards and controls 1 – 10, 12 apply)	1 Back Injuries	1 Site personnel will be instructed on proper lifting techniques, mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available	
2 Backfill excavated areas with common fill (Hazards and controls 1 – 12 apply)	2 Slip/Trip/Falls	2 Maintain work areas safe and orderly; unloading areas should be on even terrain, mark and repair if possible tripping hazards	
2 Compact areas (Hazards and controls 1 – 12 apply)	3 Vehicular Traffic	3 Spotters will be used when backing up trucks and heavy equipment and when moving equipment	
3 Place top soil (Hazards and controls 1 – 12 apply)	4 Overhead Hazards	4 Personnel will be required to wear hard hats that meet ANSI Standard Z89.1 All ground personnel will stay clear of suspended loads All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. All overhead hazards will be identified prior to commencing work operations. Work area will be cleared of personnel prior to trees being felled	
4 Hydroseed areas (Hazards and controls 1 – 12 apply)	5 Dropped Objects	5 Steel toe boots meeting ANSI Standard Z41 will be worn.	
	6 Noise	6 Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs), SHSO will determine the need for hearing protection, all equipment will be equipped with manufacturer's required mufflers	
	7 Temperature extremes	7 Controls will be implemented to minimize exposure to temperature extremes including work rest regimens, warm or cool rest areas, protective clothing, and minimize exposure time	
	8 Eye Injuries	8 Safety glasses meeting ANSI Standard Z87 will be worn	
	9 Fire	9 ABC type fire extinguishers shall be readily available, no smoking in work area; all equipment will be turned off during refueling, gasoline containers will be grounded to prevent build up of static electricity	
	10 Pinch/Cut/Smash	10 Cut resistant kevlar work gloves will be worn when dealing with sharp objects, all hand and power tools will be maintained in safe condition, guards will be kept in place while using hand and power tools No loose clothing, hair or jewelry will be worn while working with chipper Leather chaps, rated for the chain saws to be used, will be worn during chain saw use	
	11 Hand and Power Tools	11 Daily inspections will be performed, remove broken or damaged tools from service, use the tool for its intended purpose, and use in accordance with manufacturer's instructions	
	12 Heavy Equipment	12 Equipment will have seat belts, operators shall wear seat belts when operating equipment. Do not operate equipment on grades that exceed manufacturer's recommendations Equipment will have guards, canopies or grills to protect from flying objects Ground personnel will stay clear of all suspended loads. Spill and absorbent materials will be readily available Drip pans, polyethylene sheeting or other means will be used for secondary containment Ground personnel will stay out of the swing radius Eye contact with operators will be made before approaching equipment Equipment will not be approached on blind sides All equipment will be equipped with backup alarms	
EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
1 Appropriate PPE	1 Inspections will be performed on equipment prior to each use	1 Personnel have read and comply with SHSP	
2 First Aid Kits	2 Inspections will be performed on PPE prior to each use	2 Site specific training	

Project <u>Pipeline Cleaning and Closure</u>		Location <u>Naval Station Newport, Middletown, RI</u>	
Activity <u>Chamber Demolition</u>			
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS	
3 Portable Eyewash	3 Monthly inspections will be performed on first aid kits	3 Qualified operators will be used for equipment operation	
4 Fire Extinguishers	4 Portable eye wash will be inspected monthly	4 At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training	
5 Hand and Power Tools	5 Monthly inspections will be performed on fire extinguishers	5 Instruct personnel on proper use of fire extinguishers	
	6 Hand and power tools will be inspected before each use	6 Hand and power tools will be used according to manufacturer's directions	

ACTIVITY HAZARD ANALYSIS

Project: <u>Pipeline Cleaning and Closure</u> Activity: <u>Excavation of Contaminated Soils</u>		Location: <u>Naval Station Newport, Middletown, RI</u>
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1 Excavate soil (Hazards and controls 1 - 15 apply)	1 Back Injuries	1 Site personnel will be instructed on proper lifting techniques, mechanical devices should be used to reduce manual handling of materials, team lifting should be utilized if mechanical devices are not available
2 Stockpile soil (Hazards and controls 1 - 14 apply)	2 Slips/Trips/Falls	2 Maintain work areas safe and orderly; unloading areas should be on even terrain; mark and repair if possible tripping hazards.
3 Collect waste classification samples (Hazards and controls 1, 2, 5 - 8, 14, apply)	3 Vehicular Traffic	3 Spotters will be used when backing up trucks and heavy equipment and when moving equipment
4 Collect post-excavation samples (Hazards and controls 1, 2, 5 - 8, 14, apply)	4 Overhead Hazards	4 Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. All ground personnel will stay clear of suspended loads. All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. All overhead hazards will be identified prior to commencing work operations
5 Backfill excavated areas (Hazards and controls 1 - 13, 14 apply)	5 Dropped Objects	5 Steel toe boots meeting ANSI Standard Z41 will be worn
	6 Noise	6 Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); SHSO will determine the need for hearing protection; all equipment will be equipped with manufacturer's required mufflers
	7 Temperature extremes	7 Controls will be implemented to minimize exposure to temperature extremes including work rest regimens, warm or cool rest areas, protective clothing, and minimize exposure time
	8 Eye Injuries	8 Safety glasses meeting ANSI Standard Z87 will be worn.
	9 Heavy Equipment (overhead hazards, spills, struck by or against)	9 Equipment will have seat belts; operators shall wear seat belts when operating equipment. Do not operate equipment on grades that exceed manufacturer's recommendations. Equipment will have guards, canopies or grills to protect from flying objects. Ground personnel will stay clear of all suspended loads. Spill and absorbent materials will be readily available. Drip pans, polyethylene sheeting or other means will be used for secondary containment. Ground personnel will stay out of the swing radius. Eye contact with operators will be made before approaching equipment. Equipment will not be approached on blind sides. All equipment will be equipped with backup alarms
	10 Fire	10 ABC type fire extinguishers shall be readily available; no smoking in work area; all equipment will be turned off during refueling, gasoline containers will be grounded to prevent build up of static electricity
	11 Pinch/Cut/Smash	11 Cut resistant kevlar work gloves will be worn when dealing with sharp objects, all hand and power tools will be maintained in safe condition, guards will be kept in place while using hand and power tools
	12 Excavation and Trenching	12 All trenching and excavation activities will be conducted in accordance with 29 CFR 1926, Subpart P and EHS 6-3. Excavations and trenches must be inspected daily by a competent person. Atmospheric testing must be done prior to entry for trenches or excavations 4 feet deep or greater. A protective system must be used when an excavation

Project <u>Pipeline Cleaning and Closure</u>		Location <u>Naval Station Newport, Middletown, RI</u>
Activity <u>Excavation of Contaminated Soils</u>		
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
		or trench if 5 feet deep or greater or when depth is less than 5 feet and inspection by a competent person reveals conditions that may result in cave-ins Travel distance between ladders must be no more than 25 linear feet.
	13 Hand and Power Tools	13 Daily inspections will be performed; remove broken or damaged tools from service, use the tool for its intended purpose, and use in accordance with manufacturer's instructions.
	14. Chemical Exposure	14 Appropriate protective clothing per Table 6-1 will be worn during site activities; air monitoring will be conducted, skin will be rinsed with water if contact with hazardous material occurs, a portable eye wash station will be located by work area
	15 Encountering Utilities	15 All overhead/below ground utilities will be identified prior to equipment operations; no equipment or personnel closer than 10 feet to energized electrical lines or unprotected/unshielded circuits or similar structures
EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1 Heavy Equipment 2 Appropriate PPE 3 First Aid Kits 4 Portable Eyewash 5 Fire Extinguishers 7 Hand and Power Tools 8 Air monitoring equipment	1 Inspections will be performed on equipment prior to each use 2 Inspections will be performed on PPE prior to each use 3 Monthly inspections will be performed on first aid kits 4 Portable eye wash will be inspected monthly 5 Monthly inspections will be performed on fire extinguishers 7 Hand and power tools will be inspected before each use 8 Pre and post calibration required	1 Personnel have read and comply with SHSP 2 Site specific training 3 Qualified operators will be used for equipment operation 4 At least two individuals on-site will have current CPR, First aid and bloodborne pathogen training 9 Instruct personnel on proper use of fire extinguishers 10 Hand and power tools will be used according to manufacturer's directions 11 Performed by trained ESS

ACTIVITY HAZARD ANALYSIS

Project Pipeline Cleaning and Closure
Activity Heavy Equipment Decontamination

Location: Naval Station Newport, Middletown, RI

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1 Pressure wash heavy equipment and accessories (Hazards and controls 1 - 13 apply)	1 Back Injuries	1 Site personnel will be instructed on proper lifting techniques, mechanical devices should be used to reduce manual handling of materials, team lifting should be utilized if mechanical devices are not available.
	2 Slips/Trips/Falls	2 Maintain work areas safe and orderly; unloading areas should be on even terrain, mark and repair if possible tripping hazards.
	3 Vehicular Traffic	3 Spotters will be used when backing up trucks and heavy equipment and moving equipment.
	4 Overhead Hazards	4 Personnel will be required to wear hard hats that meet ANSI Standard Z89.1 All ground personnel will stay clear of suspended loads. All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. All overhead hazards will be identified prior to commencing work operations.
	5 Dropped Objects	5 Steel toe boots meeting ANSI Standard Z41 will be worn during all site activities.
	6 Exposure to Chemical Hazards	6 Appropriate protective clothing per Table 6-1 will be worn during site activities; skin will be rinsed with water if contact with hazardous material occurs; a portable eye wash station will be located by work area.
	7 Steam/Heat/Splashing	7 Use face shield and safety glasses or goggles, stay out of the splash/steam radius; do not direct stream at anyone, use shielding as necessary, personnel will be trained on the proper operation of pressure washer, pressure washer wand will be equipped with a dead man's switch, use wand extenders, thermal boots: do not aim stream at feet, knees or hands, do not hold items to be cleaned with your hand, or brace items with your knees or feet while cleaning with pressure washer.
	8 Pinch/Cut/Smash	8 Use hand tools properly and wear appropriate protective equipment, cut resistant work gloves will be worn when dealing with sharp objects, all hand and power tools will be maintained in safe condition; guards will be kept in place while using hand and power tools.
	9 Temperature Extremes	9 Drink plenty of fluids; train personnel of signs/symptoms of heat/cold stress, monitor air temperatures when extreme weather conditions are present; stay in visual and verbal contact with your buddy, and use Temperature Extremes program EHS 4-6.
	10 Hand and Power Tools	10 Daily inspections will be performed, remove broken or damaged tools from service, use the tool for its intended purpose, and use in accordance with manufacturers' instructions.
	11 Eye Injuries	11 Safety glasses meeting ANSI Standard Z87 will be worn.
	12 Fire	12 ABC type fire extinguishers shall be readily available, no smoking in work area; all equipment will be turned off during refueling, gasoline containers will be grounded to prevent build up of static electricity.
	13 Heavy Equipment Operation	13 Equipment will have seat belts, operators shall wear seat belts when operating equipment. Do not operate equipment on grades that exceed manufacturer's recommendations. Equipment will have guards, canopies or grills to protect from flying objects. Ground personnel will stay clear of all suspended loads. Spill and absorbent materials will be readily available. Drip pans, polyethylene sheeting or other means will be used for secondary containment. Ground personnel will stay out of the swing radius. Eye contact with operators will be made before approaching equipment. Equipment will not be approached on blind sides. All equipment will be equipped with backup alarms.
EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1 Hand and Power Tools	1 Initial inspection of heavy equipment will be performed upon arriving on-site.	1 Personnel have read and comply with HASP.
2 Heavy Equipment	2 Pressure washers will be inspected prior to each day's use.	2 Personnel will receive site specific training.
3 Appropriate PPE		3 Only qualified operators can operate heavy equipment or vehicles.

Project <u>Pipeline Cleaning and Closure</u>		Location. <u>Naval Station Newport, Middletown, RI</u>
Activity <u>Heavy Equipment Decontamination</u>		
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
4 Pressure Washer	3 Hand and power tools will be inspected prior to each day's use 4. PPE will be inspected before and after each use	4 Personnel have knowledge of proper use of hand and power tools 5 At least 1 individual on-site will have current CPR and first aid training.

ACTIVITY HAZARD ANALYSIS

Project <u>Pipeline Cleaning and Closure</u> Activity <u>Confined Space Entry</u>		Location: <u>Naval Station Newport, Rhode Island</u>
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1. Lockout/Tagout Electrical and Mechanical Hazards (Hazards and Controls 4 - 9 apply)	1. Back Injuries	1. Site personnel will be instructed on proper lifting techniques, Mechanical devices should be used to reduce manual handling of materials, team lifting should be utilized if mechanical devices are not available; Instruct personnel on proper lifting techniques.
2. Setup CSE equipment(Hazards and Controls 1, 2, 4 - 8, and 11 apply)	2. Slips/Trips/Falls	2. Full body harness with attached lifeline and retrieval system will be attached to the entrant such that the attendant may perform a non-entry rescue if required (for confined space entry operations only) Maintain work areas safe and orderly, unloading areas should be on even terrain, mark and repair if possible tripping hazards
3. Air Monitoring Space (Hazards and Controls 3 - 8, 10 and 11 apply)	3. Inhalation of Volatiles	3. All confined spaces will be monitored prior to and during entries. Spaces will be monitored for oxygen, combustibles and toxic at the top, middle and bottom of the space. If at all possible more than one access point should be monitored. Entries into IDLH situations will be prohibited. Refer to the attached table for inhalation action levels. If at any time during the entry air concentrations become unacceptable the entry will be terminated. All confined space activities will be performed in accordance with 29 CFR 1910.146 and Foster Wheeler Procedure 6-2.
4. Entry into confined space (Hazards and Controls 2 - 7, 9 - 12 apply)	4. Overhead Hazards	4. Personnel will be required to wear hard hats that meet ANSI Standard Z89.1
5. Operations within confined space (Hazards and Controls 2 - 7, 9 - 12 apply)	5. Dropped Objects	5. Steel toe boots meeting ANSI Standard Z41 will be worn
	6. Noise	6. Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs), SHSO will determine the need for hearing protection, all equipment will be equipped with manufacturer's required mufflers
	7. Eye Injuries	7. Safety glasses meeting ANSI Standard Z87 will be worn. A portable eye wash station will be located adjacent to work activities
	8. Sharp Objects	8. Cut resistant work gloves will be worn. All hand and power tools will be maintained in safe condition. First aid kits will be available by work area.
	9. Electrocution	9. Isolate and lockout/tagout electrical devices prior to entry, Follow lockout/tagout procedures outlined in Foster Wheeler Manual 6-4. Low voltage lighting will be used in the tanks
	10. Chemical Exposure to Fuel Oils	10. See attached table to PPE requirements during confined space operations, skin will be rinsed with water if contact with hazardous materials occurs
	11. Fire and Explosion	11. Confined spaces will be monitored (top/middle/bottom of the space) for oxygen and combustible concentrations to ensure that the potential for a fire does not exist, refer to the attached table for acceptable oxygen and LEL concentrations. All equipment used will be non-sparking; All electrical equipment brought into confined spaces will be intrinsically safe. All electrical equipment located outside of the space (i.e. blowers) shall be grounded. 10 lb ABC type fire extinguisher will be located adjacent to work area
	12. Oxygen deprivation	12. Vent space to ~19.5% oxygen. Follow FWENC EHS 6-2

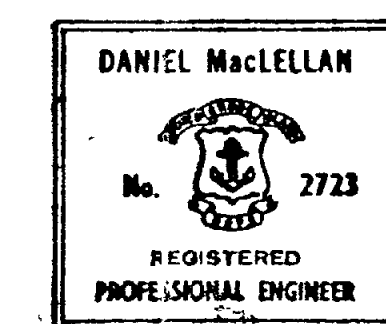
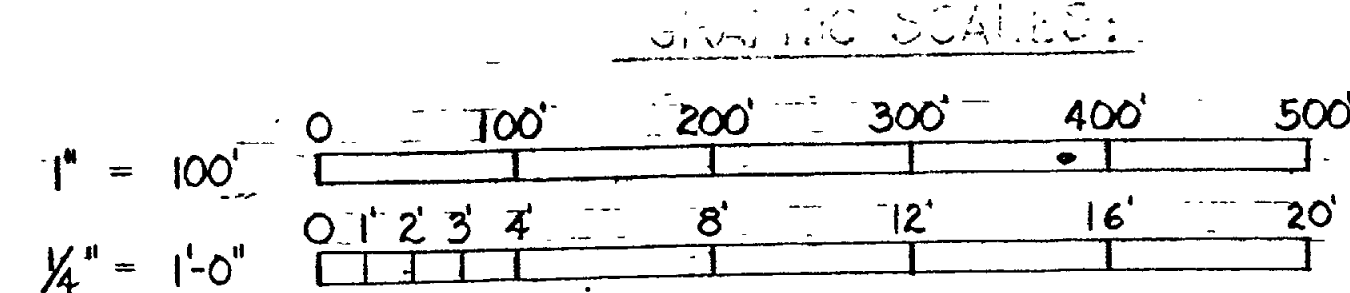
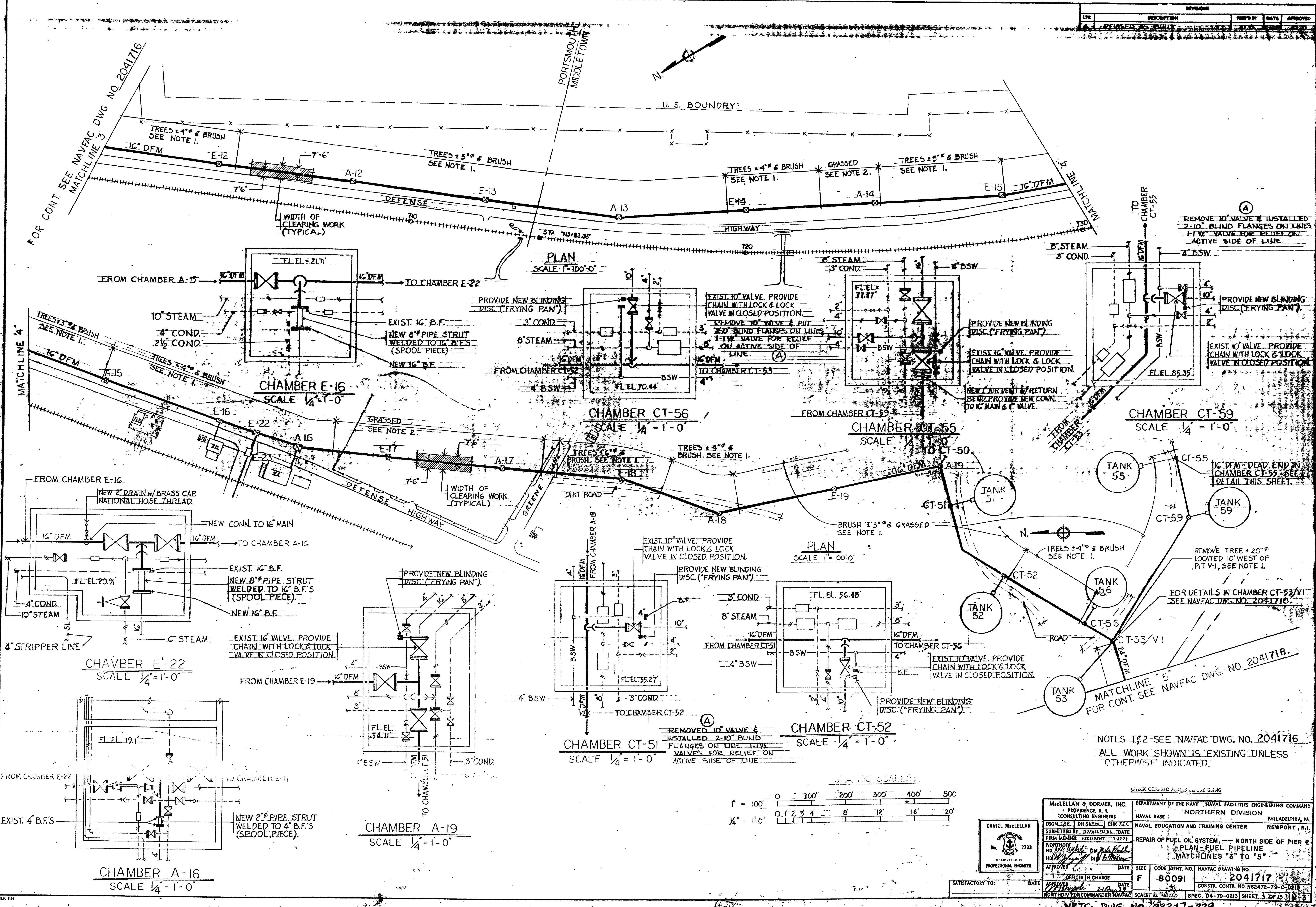
ACTIVITY HAZARD ANALYSIS

Project <u>Pipeline Cleaning and Closure</u>		Location <u>Naval Station Newport, Rhode Island</u>
Activity <u>Confined Space Entry</u>		
EQUIPMENT USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1 PPE 2 First Aid Kits 3 Portable Eyewash 4 Fire Extinguishers 5 Confined Space Entry Equipment (full-body harness, retrieval line, retrieval system, blower) 6 Air monitoring instruments	1. Pre-use inspection 2 Monthly inspections will be performed on first aid kits. 3 Portable eye wash will be inspected monthly 4 Monthly inspections will be performed on fire extinguishers 5. All confined space entry equipment will be inspected prior to each entry 6. Pre and post calibration	1 Personnel have read and comply with SHSP 2 Site specific training 3 Instruct personnel on proper use of fire extinguishers 4 At least 2 individuals on-site will have current CPR and First aid training 5 Personnel involved with confined space entries will be required to have received confined space training Pre-entry briefings into confined spaces will be conducted 6 Only cross-trained or full-time SHSO may calibrate equipment

APPENDIX B

FIGURES

REV	DESCRIPTION	REV BY	DATE	APPROVED
1	RELEASE AS SHOWN



MacLellan & DORMER, INC. PROVIDENCE, R.I. CONSULTING ENGINEERS		DEPARTMENT OF THE NAVY - NAVAL FACILITIES ENGINEERING COMMAND NORTH DIVISION PHILADELPHIA, PA. NEWPORT, R.I.	
DSGN. TRP. BY: D.M. CHK. J.T.K. SUBMITTED BY: D.M. DATE: 7-27-71 FIRM MEMBER: PRESIDENT: 7-27-71		NAVAL EDUCATION AND TRAINING CENTER REPAIR OF FUEL OIL SYSTEM - NORTH SIDE OF PIER 2 PLAN - FUEL PIPELINE MATCHLINES "3" TO "5"	
APPROVED: [Signature] OFFICER IN CHARGE		DATE: 21 AUG 71 SIZE: F CODE IDENT. NO.: 80091 NAVFAC DRAWING NO.: 2041717	
SATISFACTORY TO: [Signature] DATE: 21 AUG 71		CONSTRUCTION NO. 62472-79-C-0218 SCALE: AS NOTED SHEET 5 OF 13	

NETC DWG. NO. 22217-229

APPENDIX C

CONFINED SPACE ENTRY

EHS 6-1:

Confined Space Entry (Previously HS6)

Original Issue Date:	Version Date:	04/04/2000 - Revised 02/01/95
	Department/Category:	Environmental, Health Safety - Programs
	Document Type:	Procedure
Keyword Index: Monitoring, Training, Field Activities/Science, Operational Control		

Purpose

When required, this program provides the requirements to ensure a safe working environment within and around confined space operations by evaluating confined space hazards, implementing necessary controls, and regulating employee entry into confined spaces in accordance with 29 CFR 1910.146, Permit-Required Confined Spaces

Approved by: I

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1.0 PURPOSE

When required, this program provides the requirements to ensure a safe working environment within and around confined space operations by evaluating confined space hazards, implementing necessary controls, and regulating employee entry into confined spaces in accordance with 29 CFR 1910.146, Permit-Required Confined Spaces.

Confined space entries should only be made if there is not a feasible method of performing the task from outside of the confined space.

2.0 SCOPE

This program applies to all Foster Wheeler Environmental Corporation (FWENC) employees, operations, and subcontractors.

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with FWENC's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Director, Administration and Compliance.

4.0 DEFINITIONS

4.1 Acceptable Entry Conditions

The conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

4.2 Attendant

An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

4.3 Confined Space

An enclosed area which exhibits the following characteristics:

- Is large enough and so configured that an employee can bodily enter;
- Has limited or restricted means for entry or exit; and
- Is not designed for continuous occupancy.

4.4 Double Block and Bleed

The closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

4.5 Engulfment

The surrounding and effective capture of a person by a liquid or finely divided solid substance that can

be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

4.6 Confined Space Entry Permit

The completed document which specifies the hazards, controls, and procedures for a confined space entry.

4.7 Entry

The action by which a person passes through an opening into a confined space. Entry is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

4.8 Entry Supervisor

The person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

4.9 Hazardous Atmosphere

An atmosphere which meets one or more of the following criteria:

- Flammable gas, vapor, or mist in excess of 10 percent of the lower explosive limit, or
- An airborne concentration of a dust at a concentration that meets or exceeds its lower explosive limit (rule of thumb - visibility obscured at a distance of 5 feet); or
- Atmospheric concentration of any substance which could result in employee exposure in excess of its recommended exposure limit, i.e., Permissible Exposure Limit (PEL), Threshold Limit Value (TLV), or manufacturer's limit; or
- Immediately dangerous to life or health (IDLH).

4.10 Inerting

The displacement of the atmosphere in a permit space by a noncombustible gas to such an extent that the resulting atmosphere is noncombustible.

4.11 Isolation

A pre-entry requirement which assures that the confined space has been completely taken out of service and insures that accidental introduction of hazardous substances into the confined space may not take place. Isolation may include blinding, double blocking with bleed valves, capping, and/or lockout/tagout.

4.12 Line Breaking

The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

4.13 Non-permit Required Confined Space

A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm

4.14 Oxygen Deficient

An atmosphere containing less than 19.5 percent oxygen by volume.

4.15 Oxygen Enriched

An atmosphere containing 22.0 percent or more oxygen by volume (Note: The 22% upper limit is an NFPA 306k, Certification of Hot Work, Consensus Standard.)

4.16 Permit Required Confined Space

A confined space which has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere,
- Contains a material that has the potential for engulfment of the entrant, or
- Has an internal configuration that could trap or asphyxiate an entrant

4.17 Prohibited Conditions

Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

4.18 Retrieval System

The equipment used for non-entry rescue of persons from permit spaces.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Authorized Entrants

Entrants are responsible for the following:

- Inspection of operability and integrity of all respiratory apparatus, safety equipment, and personal protective equipment (PPE) to be used/worn;
- Knowing hazards, mode of exposure, signs and symptoms, and consequences of hazardous exposure;

- Communicating with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space;
- Notifying the attendant of undetected / unnoticed hazards which could cause harm or injury to team personnel, warning signs and symptoms of exposure, and prohibited conditions;
- Wearing the designated respiratory apparatus, safety equipment, and PPE in accordance with EHS 5-2, Respiratory Protection and EHS 5-1, Personal Protective Equipment;
- Knowing the emergency procedures; and
- Exiting from the permit space when evacuation is ordered, warning signs or symptoms of exposure are noted, a prohibited condition is noted, or an alarm is activated.

5.1.2 Attendants

Attendants are required to assume the following duties and responsibilities:

- Inspection of operability and integrity of all respiratory apparatus, safety equipment, and PPE to be used/work in accordance with EHS 5-2, Respiratory Protection and EHS 5-1, Personal Protective Equipment;
- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
- Be aware of possible behavioral effects of hazard exposure in authorized entrants;
- Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space;
- Leave their position only after being physically replaced by another attendant. If required to leave their post and no replacement is available, they must evacuate all personnel from within the confined space before leaving;
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and order the authorized entrants to evacuate the permit space immediately if a prohibited condition is noted, if an authorized entrant shows behavioral effects of a hazard exposure, if a saturation develops outside the confined space that may endanger the entrants, or if the attendant cannot effectively and safely perform his or her required duties;
- Summon rescue and emergency services;
- Warn unauthorized persons that they must stay away from the permit space, advise them to exit immediately if they enter the permit space, and inform the entry supervisor if they enter the space;
- Perform non-entry rescues;
- Perform no duties that interfere with the attendant's primary duty to monitor and protect the authorized entrants;
- Remain in constant communication with the entrant at all times; and

- Perform atmospheric monitoring per the confined space permit under the direction of the entry supervisor, if trained to perform the monitoring.

5.1.3 Entry Supervisors

Entry supervisors have the following responsibilities:

- Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposures;
- Verifies by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin;
- Verifies that rescue services are available and that the means for summoning them are operable;
- Removes unauthorized individual who enter or who attempt to enter the permit space during entry operations;
- Determines, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained;
- Ensures full compliance with FWENC and customer permit requirements;
- Ensures that all confined space pre-entry precautions have been taken,
- Ensures that atmosphere/personnel monitoring is performed at adequate frequencies to protect the safety and well being of the entry personnel;
- Ensures that emergency procedures and individual assignments are clearly defined, and to coordinate rescue procedures if necessary; and
- Terminates the entry and cancels the permit.
- · The entry supervisor may also serve as attendant.

5.1.4 Line Management

The Project Manager (PM) has the responsibility for:

- Ensuring implementation of the confined space entry program
- Ensuring that only trained, qualified, and medically fit personnel participate in confined space entry operations; and
- Ensuring that adequate, appropriate, and properly maintained equipment required to safely enter a confined space and successfully complete the task.

5.2 Procedure

The following sections provide the requirements for pre-entry activities, pre-entry briefings, confined space operations, and program review requirements. Complete implementation of these requirements is necessary to ensure the health and safety of personnel during confined space operations.

No entries shall be made into confined spaces with:

- IDLH atmospheres;
- LEL readings in excess of 10% or a combustible dust atmosphere in excess of the LEL; or
- An oxygen content of less than 19.5% or greater than 22.0%.

5.2.1 Hazard Evaluation

Prior to the initiation of a confined space entry, a hazard evaluation of the space shall be conducted by the entry supervisor to determine what chemical and physical hazards are present. This review shall be documented on the entry permit and include, but not be limited to the following:

- Potential for oxygen deficient or enriched atmosphere,
- Presence of a flammable atmosphere;
- Presence of toxic air contaminants;
- Presence of physical hazards;
- Sources of hazardous energy that must be de-energized to effectively isolate the confined space;
- Other permits, such as hot-work or lockout/tagout, required to control hazards; and
- Acceptable entry conditions.

Various sources of information for hazard identification that may be used include blueprints, as-builts, client employee knowledge, past entry information, air monitoring data, and physical inspection. For each hazard identified, an effective means of control shall be documented on the confined space entry permit.

5.2.2 Atmospheric Testing

The atmosphere of the confined space shall be tested to determine the initial concentrations of the following:

- Oxygen content;
- Flammable or combustible gases or vapors; and
- Toxic air contaminants.

Testing for the initial concentrations shall be conducted in the order given and documented on the entry permit. LEL, oxygen, and toxicity readings must be taken at least every 15 minutes. If isolation of the

space is unfeasible because the space is large or part of a continuous system, the monitoring shall be

continuous. Frequency for periodic monitoring during the confined space entry shall be specified and documented on the permit.

5.2.3 Ventilation

Mechanical ventilation shall be initiated where necessary to prevent exposure of employees to hazardous atmospheres. The ventilation shall meet the following requirements:

- It shall be continuous;
- It shall be directed into the immediate area authorized entrants shall work in;
- The air supply shall be from a clean source and shall not increase the hazards in the area; and
- Employees shall not enter the space until the ventilation clears the hazardous atmosphere.

When ventilation practices cannot be used, a supplied air respirator must be utilized. Exceptions may be made by the Project Environmental and Safety Manager (PESM).

Ventilation equipment must be bonded and grounded prior to operation. Ventilator exhausts must be directed down wind from personnel and/or areas that contain buildings, equipment, etc.

5.2.4 Isolation

All permitted spaces shall be removed from service and completely protected against the release of energy and material into the space. Means used to isolate the space include but are not limited to the following:

- Lockout/tagout in accordance with EHS 6-4;
- Disconnection of mechanical linkages and hazards;
- Blanking, blinding, or misaligning piping; or
- Double blocking and bleeding.

5.2.5 Equipment Staging

The following equipment shall be available as necessary and inspected prior to use.

- Testing and monitoring equipment;
- Ventilation equipment
- Communications equipment;
- Personal protective equipment;
- Lighting equipment (caged, waterproof, and low voltage);
- Barriers and shields;

- Ingress and egress equipment;
- Rescue and emergency equipment; and
- Any other equipment required to make safe entry into the space.

In spaces where the potential for flammable or combustible atmospheres exists, equipment shall be non-sparking and intrinsically safe. Electrical systems shall be GFCI protected.

5.2.6 Emergency and Rescue Procedures

Based upon the location, hazards, and configuration of the confined space, the entry supervisor shall ensure that the following items are addressed:

- Rescue and emergency services to be used and means of summoning,
- Means of rescuing entrants;
- Rescue and emergency to be used at the site;
- Duties of personnel during emergencies; and
- Prevention of unauthorized entry during rescues.

5.2.7 Client/Contractor Coordination

To ensure safe and efficient operations when FWENC personnel and client or subcontractor employees will make entry together into the same confined space, the following shall be completed by the entry supervisor:

- Inform FWENC contractors of existing confined spaces;
- Provide FWENC contractors with a copy of this program;
- Inform the contractor of known hazards in the space;
- Provide a list of controls implemented previously;
- Coordinate the entry of the personnel; and
- Debrief the contractor regarding this program and any hazards encountered.

When FWENC personnel are required to perform confined space entry in support of client work, the entry supervisor shall complete the following in addition to the above requirements:

- Obtain any available information on the space from the client;
- Coordinate the entry operations with client personnel; and

- Inform the client of entry hazards encountered.

5.2.8 Pre-Entry Briefing

Prior to initiating a confined space entry, the entry supervisor shall conduct a safety briefing with the authorized entrants, attendants, and other relevant personnel. The briefing shall cover the following at a minimum:

- Hazard Communication (including the signs, symptoms, and modalities of chemical over exposure) in accordance with EHS 4-2, Hazard Communications;
- Physical hazards present;
- All hazard controls;
- Acceptable entry conditions;
- Emergency procedures;
- Rescue procedures;
- Duties of entrants and attendants during routine and emergency operations;
- Frequency and Types of air monitoring,
- Communications system and backup to be used,
- Review of work to be accomplished during entry,
- Decontamination procedures (if necessary);
- PPE disposal; and
- Potential emergencies that may occur outside the confined space.

Attachment A or an equivalent checklist shall be used to document pre-entry briefing

At the end of the briefing, all personnel shall be given opportunity to ask questions and review the permit. After review, each authorized entrant and attendant shall print and sign his/her name on the permit. The completed permit shall be posted at the entry site and serve as a roster for monitoring entry and exit of personnel from the space.

5.2.9 Confined Space Operations

The following practices shall be adhered to during actual confined space entries:

- All confined spaces will be treated as permit-required confined spaces unless the PESM specifically provides an exemption in the EHS Plan, or by a field change request to the Plan. Prior to entry, a properly executed permit shall be in place and signed by the Entry Supervisor, Attendant, and each Entrant. Attachment B, or an equivalent form that is approved for use by

the PESM, shall be used.

The Entry Supervisor shall certify that all equipment is in place and operable, acceptable entry conditions are present, all personnel have been fully briefed and all personnel have signed the permit prior to initiating entry.

- The work area outside the space shall be barricaded to prevent unauthorized personnel from interrupting the attendants or entering the space. Unauthorized personnel shall be asked to leave the barricaded area. If unauthorized personnel refuse to leave the area, operations shall be terminated.

- Atmospheric monitoring for oxygen, LEL, and toxic air contaminants shall be conducted at the frequency noted on the permit. Results shall be logged on the permit.

- No confined space shall be entered without:

- A full body harness;

- A 6' lanyard attached to the harness "D" ring; and

- A lifeline attached to the lanyard with the opposite end secured outside the confined space. The lanyard and lifeline must have double locking rings.

Note: Wristlets may be used in lieu of a full body harness if the body harness is infeasible or creates a greater hazard.

- Top entries with a fall potential greater than 5 feet shall be made with fall protection. Fall protection shall meet the criteria specified in 29 CFR 1926.502(d).

- At least one attendant is required for permit-required entries. The attendant shall maintain visual or voice communications with entrants at all times. Attendants shall not leave their post unless formally relieved by another authorized attendant. The replacement shall be fully briefed by the entry supervisor on all information covered in the pre-entry briefing. Entry supervisors may also serve as attendants.

- When any confined space is entered where the noise level or respirator used prevents voice communication, visual contact between the standby and workers must be maintained.

- Metal ladders, hand tools or other instruments which may spark or cause a source of ignition, are not to be used within confined spaces where any detectable amounts of LEL's are present

- No burning, grinding, chipping, or other operation which produces heat, sparks, or ignition sources are to be performed without a hot work permit.

- One attendant shall be dressed in the same PPE as the authorized entrants, except for respiratory protection. Attendant supplied air shall be from a different source than that of authorized entrants.

- The entry supervisor shall terminate operations when the work is completed, an unacceptable entry condition is detected, or another emergency inside or outside the space is detected. Authorized entrants shall immediately evacuate upon notification of the termination.

- Attendants may monitor multiple sites only if they are able to maintain continuous visual or voice communications with entrants. If continuous communications cannot be maintained, additional attendants shall be used.

· Attendants shall perform non-entry rescues in emergencies using rescue equipment staged at the site.

· Upon completion of work and exit of the entrants, the permit shall be canceled by the entry supervisor and forwarded to the ESS. Permits shall be maintained as a part of the project file.

5.2.10 Deviation From Program Requirements

· Any deviation from this procedure requires the approval of the PESM.

· Approval for entry into permit-required confined spaces with air purifying respirators will be given if:

- The composition of the hazardous substance(s) in the confined space is well defined;
- The hazardous substance(s) have good warning properties;
- Short-term exposure to the hazardous substance(s) in excess of the recommended exposure limit will not result in serious physical harm;
- The efficiency of the cartridge versus the hazardous substance(s) is known,
- Forced air ventilation is utilized;
- Reliable monitoring methods are available, and
- Monitoring shows airborne concentrations to be less than the recommended exposure level for the contaminants.

5.2.11 Identification of Confined Spaces

A survey of the sites shall be performed prior to the start of work and documented to identify permit-required confined spaces. All permit-required confined spaces shall be identified with a sign. The sign shall contain the following wording of equivalent:

DANGER - PERMIT REQUIRED CONFINED SPACE

DO NOT ENTER

5.2.12 Program Review

The effectiveness of program implementation shall be reviewed by the PESM during site EHS inspections pursuant to EHS 3-3, Inspections, using the canceled permits and relevant incident information. The program will be modified, as necessary, on the basis of the PESM program reviews.

5.2.13 Training

Authorized entrants, attendants, and entry supervisors shall be trained in accordance with 29 CFR 1910.146 (g) including the following topics as appropriate:

- The contents of this procedure;
- Their respective duties;

CPR /First Aid (attendants and entry supervisors if they are serving as rescue personnel);

- Hazards commonly found in confined spaces;
- Lockout/tagout procedures;
- Isolation practices;
- Ventilation of confined spaces;
- Supplied air respiratory protection and SCBAs;
- Self rescue;
- Methods of communication;
- Atmospheric monitoring, and
- Rescues.

Training shall establish employee proficiency in the skills required for confined space entry and the understanding and knowledge for the safe performance of all duties required by this procedure. Training records shall be maintained in accordance with EHS 1-9, Recordkeeping.

6.0 REFERENCES

Environmental, Health & Safety Programs EHS 1-9, Recordkeeping
 Environmental, Health & Safety Programs EHS 3-3, Inspections
 Environmental, Health & Safety Programs EHS 4-2, Hazard Communications
 Environmental, Health & Safety Programs EHS 5-1, Personal Protective Equipment
 Environmental, Health & Safety Programs EHS 5-2, Respiratory Protection
 Environmental, Health & Safety Programs EHS 6-4, Lockout/Tagout
 OSHA (U.S. Department of Labor, Occupational Safety and Health Administration)
 29 CFR 1910.146, Permit-Required Confined Spaces
 29 CFR 1926.502(d), Fall Protection.

7.0 ATTACHMENTS

ATTACHMENT A - PRE-ENTRY BRIEFING CHECKLIST
 ATTACHMENT B - CONFINED SPACE ENTRY PERMIT

**ATTACHMENT A
PRE-ENTRY BRIEFING CHECKLIST**



**FOSTER WHEELER ENVIRONMENTAL CORPORATION
CONFINED SPACE ENTRY PRE-ENTRY BRIEFING CHECKLIST**

Project Name: _____ **Project Location:** _____

Date: _____ **Time:** _____

Completed By: _____

Attendee(s): _____

- ☐ Hazard Communication (including the signs, symptoms, and modalities of chemical overexposure
- ☐ Physical hazards present.
- ☐ All hazard controls
- ☐ Acceptable entry conditions
- ☐ Emergency procedures
- ☐ Rescue procedures.
- ☐ Duties of entrants and attendants during routine and emergency operations
 - ☐ Frequency and Types of Monitoring
- ☐ Communications system backup to be used
- ☐ Review of work to be accomplished during entry.
- ☐ Decontamination procedures (if necessary)
- ☐ PPE disposal
- ☐ Potential emergencies that may occur outside the confined space.



FOSTER WHEELER ENVIRONMENTAL CORPORATION

CONFINED SPACE ENTRY PERMIT

PERMIT VALID FOR ONE SHIFT ONLY. ALL PERMIT COPIES REMAIN AT SITE UNTIL JOB COMPLETED.

DATE: _____ SITE LOCATION/DESCRIPTION: _____

PURPOSE OF ENTRY: _____

SUPERVISOR(S) IN CHARGE OF CREWS/TYPE OF CREW/PHONE # _____

COMMUNICATION PROCEDURES: _____

RESCUE PROCEDURES AND PHONE NUMBERS: _____

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED
DATE			TIME
Breathing Apparatus	_____	_____	Line(s) Broken-Cappe Blank
Emergency Escape/Fall Retrieval	_____	_____	Protective Clothing
Equipment	_____	_____	Purge-Flush and Vent
Fire Extinguishers	_____	_____	Respiratory Protection
Full Body Harness w/ "D" Ring	_____	_____	Secure Area (Post and Flag)
Lifelines	_____	_____	Standby Safety Personnel
Lighting (Explosive Proof)	_____	_____	Ventilation

Note: For items that do not apply, enter N/A in the blank. See reverse side for special requirements.

RECORD MONITORING RESULTS EVERY 1/4 HOUR

TEST(S) TO BE TAKEN	Permissible	Time(s)						
	Entry Level							
PERCENT OF OXYGEN	19.5% to 22.0%							
LOWER FLAMMABLE LIMIT	Under 10 %							

REMARKS: _____

GAS TESTER NAME & CHECK #

INSTRUMENT(S) USED

MODEL &/OR TYPE

SERIAL &/OR UNIT #

SUPERVISOR AUTHORIZATION—ALL CONDITIONS SATISFIED _____

DEPT/PHONE _____

PRINT NAME

SIGNATURE

FUNCTION (i.e., entrant, attendant, or supervisor)

SPECIAL REQUIREMENTS:

COMMENTS

APPENDIX D

HEAT STRESS PREVENTION

EHS 4-6:

Temperature Extremes (Previously HS4-6)

Original Issue Date:

Version Date: 03/17/1998 - Revised

02/01/95

Department/Category: Environmental, Health & Safety -
Programs

Document Type: Procedure

Keyword Index: EHS Compliance/Waste Management, Monitoring, Operational Control, Training

Purpose

The purpose of this program is to prevent heat and cold stress related injuries and illnesses at field operations

Approved
by:



FOSTER WHEELER ENVIRONMENTAL CORPORATION

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Proprietary Information

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1.0 PURPOSE

The purpose of this program is to prevent heat and cold stress related injuries and illnesses at field operations.

2.0 SCOPE

This program applies to all Foster Wheeler Environmental Corporation (FWENC) and subcontractor field personnel that may be exposed to heat or cold stress during the performance of their field work assignments.

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with FWENC's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Director, Administration and Compliance

4.0 DEFINITIONS

4.1 Adjusted Temperature

The dry bulb temperature adjusted to account for solar radiation, to be used as a heat stress indicator for personnel in impermeable protective clothing.

4.2 Deep Frostbite

The tissue beneath the skin is solid to the touch; it may involve a full thickness freeze to the bone. This is an extreme emergency and can result in permanent tissue loss.

4.3 Frostbite

Freezing of body tissue.

4.4 Frostnip or Incipient Frostbite

A cold related injury that progresses slowly and is painless while developing. The victim is usually unaware that he/she has frost nip. The skin first becomes reddened, then changes to white; no freezing of tissue occurs.

4.5 Heat Cramp

Painful muscle spasms usually occurring on the arms, legs, and abdomen; caused by excessive loss of body electrolytes from profuse sweating.

4.6 Heat Exhaustion

A form of shock that occurs when the body loses large amounts of water and electrolytes from excessive perspiration after exposure to heat and physical activity; also called heat prostration.

4.7 Heat Rash

Profuse tiny raised red vesicles (blister-like) on affected areas of the skin which cause a prickling sensation during heat exposure.

4.8 Heat Stroke

A life-threatening condition caused by rapidly rising body core temperature that occurs when the body's temperature regulating mechanisms are overwhelmed. Sweating stops and the skin is dry and hot.

4.9 Hyperthermia

A rise in body core temperature above 99.6 C.

4.10 Hypothermia

Decreased body core temperature from prolonged exposure to freezing or near-freezing temperatures. This is the most life-threatening cold injury and affects the entire body with possible localized severe cooling.

4.11 Superficial Frostbite

Frostbite which affects the skin and tissue just beneath the skin. The skin is firm and waxy, tissue beneath is soft and numb. The skin turns purple and may tingle and burn during warming.

4.12 Wet-Bulb Globe Temperature (WBGT)

Method used to measure the environmental factors (e.g., temperature, relative humidity) which impacts the body's physiological responses to heat.

4.13 Wind-Chill Factor or Equivalent Chill Temperature (ECT)

An index describing the effect of the cooling power of moving air on exposed flesh. The effect of wind velocity at a certain temperature is expressed as the equivalent cooling effect of a lower temperature with still air.

4.14 Work/Rest Regimen

The ratio of time spent working to time spent resting in an area designed to relieve heat related conditions. This ratio is expressed in one hour periods. Example: A work/rest regimen of 75% work, 25% rest corresponds to 45 minutes work, 15 minutes rest each hour.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Field Personnel

All field personnel will be trained in heat and cold stress prevention and treatment. Field personnel will monitor themselves and their workmates for symptoms of heat and cold stress and will inform the Environmental and Safety Supervisor (ESS) or their supervisor immediately should symptoms become apparent.

5.1.2 Line Management

Site Supervisors have the responsibility to:

- Provide resources and facilities necessary to prevent health effects from temperature extremes
- Enforce work rules related to such prevention
- Ensure implementation of the requirements of this program as specified in the Site Environmental, Safety and Health (EHS) plans.

5.1.3 Environmental, Health and Safety Personnel

The Project Environmental and Safety Manager (PESM) will make the initial determination of heat and cold stress prevention requirements as part of the site EHS Plan (see EHS 3-2, EHS Plans) and oversee the implementation of this program on a project basis for all FWENC field programs.

The ESS will assist with implementation of heat and cold stress prevention programs. The ESS will, in most cases, be the person responsible for monitoring heat and cold stress on the job, determining work/rest and work/warm-up schedules where used, and will implement emergency response or corrective action, if needed. The ESS will train site personnel on the effects of temperature extremes and the site prevention program, and will maintain records related to this program.

5.2 General Program Requirements

Adverse weather conditions must be considered when planning site operations. Excessively hot or cold working environments can produce a number of different injuries

Critical to the ability to care for those injuries is a basic understanding of the way in which the body maintains its temperature and how it physiologically adjusts to extremes of heat and cold. Attachment A provides information on the body's physiological responses to heat and cold stress.

Proper care of victims who are suffering from the effects of heat or cold exposure will help to minimize injuries and speed recovery. On the other hand, improper treatment of these emergencies can result in serious injury, disability, or death.

The most effective first aid for any injury is prevention. When acceptable monitoring and prevention programs are followed, there should be no victims.

5.3 Heat Stress

A heat stress prevention program will be implemented when ambient temperatures exceed 70°F for personnel wearing impermeable clothing and for other personnel when the WBGT index exceeds the ACGIH Threshold Limit Values.

5.3.1 Selection of Chemical Protective Clothing

The PESM will review site data and working conditions and select the personal protective equipment ensemble that best protects the employees from site hazards. The risk of heat related illness will be fully considered in balancing the risks and benefits of the PPE. Where contact with a waste material is unlikely, contact is not expected to result in a serious dermal hazard; and significant absorption of the contaminants is not likely to occur, then impermeable clothing should not be required. In this case, the risk of heat related illness may grossly outweigh the benefits provided by such equipment. Even when chemical protective clothing is needed, the PESM should consider the probable exposure scenarios and select protective equipment accordingly. For example, if dermal exposure is likely to be localized, strong consideration should be given to using gloves, boots, gauntlets, leggings, aprons, bibs, face shields, etc., in lieu of full body coveralls and respirators.

5.3.2 Hydration

FWENC will supply cool (50°–59°F) potable water or other suitable drinks (e.g., sport electrolyte replacements) for fluid replacement. Employees involved in the heat stress prevention program will be trained and encouraged to drink at a rate of approximately 8 oz. every 20 minutes. Individual cups will be used and kept in closed containers or dispensers.

5.3.3 Cool Rest Areas

Shaded rest areas will be provided. On large remediation projects, air conditioned rest areas should be provided for workers exposed to heat stress conditions.

5.3.4 Other Prevention Program Elements

The PESM, ESS and the Project Manager will incorporate other elements into the heat stress prevention program as necessary. The selected elements will be described in the EHS plans. Engineering controls are preferred. Where their use is not feasible, the program must incorporate administrative/work practice controls, personal protective equipment, or a combination. Examples of other prevention program elements include:

- **Engineering Controls**

Engineering controls may include:

- ¾ Air conditioned cabs for heavy equipment and vehicles (Such controls may eliminate the need for other program elements);
- ¾ Fans or blowers; and
- ¾ Cold water for drenching personnel in impermeable clothing. This can be provided through a garden hose, a garden sprayer filled with ice water, a clean drum full of water for "hard hat dipping" or containers of ice water and clean towels in the rest area to hasten cool down.

- **Administrative and Work Practice Controls**

Administrative controls include:

- ¾ Adjusting work schedules to do the bulk of the work during the cooler parts of the day,
- ¾ Acclimatizing workers; and
- ¾ Implementing work/rest regimens (See Attachment B for Work/Rest Regimen Procedures).

- **Personal Protective Equipment**

Personal cooling devices which may be useful include:

- ¾ Ice vests;
- ¾ Circulating water vests; and
- ¾ Vortex tubes.

Where ice vests and circulating water vests are used, rest periods of approximately 15 minutes should be taken when ice packs or batteries need to be changed. Continuous work over long periods of time with these devices may present an increased musculoskeletal injury risk due to the extra weight. Since the duration of the cooling effectiveness of these devices will vary with heat and work loads, users must be instructed to leave the area to replenish ice or batteries at the first sign of loss of cooling

- **Monitoring**

A program of environmental and physiological monitoring must be established in order to use work/rest regimens. The monitoring procedures are described in Attachment B.

5.3.5 Training

All site personnel must receive training on the following topics:

- Health effects of hot environments and symptoms of heat related illness,
- Personal risk factors;
- Effect of personal protective equipment on heat stress conditions;
- Preventive measures;
- Fluid replacement;
- Elements of the site Heat Stress Prevention Program; and
- First aid and emergency response.

Records shall be maintained in accordance with EHS 1-9, Recordkeeping

5.4 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trenchfoot or immersion foot, and hypothermia as well as slippery surfaces, brittle equipment, poor judgement and taking short cuts. The current ACGIH threshold limit values (TLVs) for cold stress will be used as a guideline. FWENC will implement the following cold stress prevention program elements when there is a potential for cold related injuries.

5.4.1 Personal Protective Equipment

The following personal protective equipment will be provided as necessary to FWENC employees when conditions indicate a potential for cold-related injury. Subcontractors will be expected to supply appropriate equipment to their employees.

- Hard hat liners,
- Gloves or glove liners,
- Rain gear or water impermeable coveralls and gloves for potentially wet operations,
- Fleeced boot liners where rubber steel-toe boots are used, and

- Winter coveralls.

5.4.2 Engineering Controls

A variety of engineering controls shall be evaluated to minimize cold stress. These include:

- General or spot heating should be used to increase temperature at the workplace.
- If fine work is to be performed with bare hands in a cold environment, special provisions should be made to keep the worker's hands warm. Warm air jets, radiant heaters, or contact warm plates can be used.
- The work area should be shielded from winds and drafts that may affect the wind chill factor.
- The air velocity in refrigerated rooms should be minimized as much as possible, and should not exceed 1m/sec in the work zone.
- At temperatures below freezing, metal handles of tools and control bars should be covered with thermal insulating material.
- Unprotected metal chair sets should not be used as they conduct heat away from the body.
- When necessary, equipment and processes should be substituted, isolated, relocated, or redesigned to reduce cold stress at the worksite
- Power tools, hoists, cranes, or lifting aids should be used to reduce metabolic workload
- Heated warming shelters such as tents and cabins should be made available if work is performed continuously in an equivalent chill temperature of 20°F or below.
- The ESS may implement a work-rest schedule to reduce exposure to cold stress
- Scheduled rest breaks should be enforced.
- Personnel exposed to the cold should be provided the opportunity for frequent intake of warm, sweet, caffeine-free, nonalcoholic liquids or soup.
- Work should be moved to warmer areas whenever possible.
- Extra workers should be assigned to highly demanding tasks.
- Workers should be allowed to pace themselves, taking breaks when needed.

- Workers shall be trained in the prevention, symptoms, and emergency response to cold stress.
- Utilize the "buddy system" to monitor cold stress symptoms among the workers.
- Allow new employees time to adjust or "acclimate" to cold conditions.
- Minimize the need to sit or stand in one place for long periods of time.
- Minimize the amount of work time spent in a cold environment.
- Allow for the weight and bulkiness of protective clothing when estimating work performance goals² and tasks.

5.4.3 Warm Rest Areas

FWENC will make warm rest areas, e.g., heated trailers, available for rest breaks in cold weather. Employees will be permitted and encouraged to use the heated trailers whenever they experience symptoms of cold stress.

5.4.4 Work/Warm-up Schedule

The work/warm-up schedule found in the ACGIH TLVs for cold stress will be followed. In addition, FWENC will make warm-up periods available to employees who need to change into dry clothing to prevent immersion foot or hypothermia.

5.4.5 Training

All FWENC employees and subcontractors will be trained in:

- The effects of cold stress, including frostbite, immersion foot and hypothermia;
- Personal risk factors;
- Recognition of the symptoms;
- Methods employees can use to protect themselves; and
- First aid procedures and recognition of medical emergencies.

Records shall be maintained in accordance with EHS 1-9, Recordkeeping.

6.0 REFERENCES

ACGIH (American Conference of Government Industrial Hygienists)
Threshold Limit Values for Chemical Substances and Physical Agents and Biological
Exposure Indices, 1994-95.
Environmental Health & Safety Programs EHS 1-9, Recordkeeping

Environmental Health & Safety Programs EHS 3-2, EHS Plans
NIOSH (National Institute for Occupational Safety and Health)
Occupational Exposure to Hot Environments, Revised Criteria 1986.
NIOSH/OSHA/EPA/USCG/EPA
Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities
October 1985.
National Safety Council
Fundamentals of Industrial Hygiene. Third Edition, 1988.

7.0 ATTACHMENTS

Attachment A - Heat and Cold Stress Information
Attachment B - Work/Rest Regimens and Monitoring

ATTACHMENT A (Page 1 of 6)
HEAT AND COLD STRESS INFORMATION



FOSTER WHEELER ENVIRONMENTAL CORPORATION

HEAT AND COLD STRESS INFORMATION
HEAT STRESS

Hot weather can cause physical discomfort, loss of efficiency, and personal injury. The human body strives to maintain a constant core temperature of 98.6°. If this temperature is to be maintained, heat loss must equal heat production. This balance is maintained by variations in the blood flow to the outer part of the body. When the core temperature rises, blood vessels beneath the skin dilate, and the blood brings increased heat to the skin, where it is dissipated by radiation and convection. This works only as long as the skin temperature is lower than the temperature of the outside environment. Heat loss by radiation convection is impossible when the temperature of the outside air approaches or exceeds the temperature of the skin. The body will now rely on dissipation through evaporation of sweat. But the sweat mechanism also has limits. The normal adult can sweat only about one liter per hour and can sweat at that rate for only a few hours at a time. In addition, sweating only works if the relative air humidity is low. Sweat evaporation ceases entirely when the relative humidity reaches 75 percent.

Of particular concern in heat stress monitoring is the use of personal protective clothing which decreases natural body ventilation and greatly increases the temperature and humidity to the skin. If precautions are not taken, heat stress will progress into a heat-related injury. Heat-related injuries fall into three major categories: heat cramps, heat exhaustion, and heat stroke

Heat Cramps

Symptoms

Heat cramps are the least common and least severe of heat injuries. Heat cramps occur when the electrolytic balance in the blood between water, calcium, and sodium (salt) is altered. Low blood salt level, from profuse sweating and inadequate salt consumption, is the usual cause.

Symptoms of heat cramps include:

- Severe muscle cramps and pain, especially of the upper legs, calves, and abdomen, and occasionally in the arms
- Faintness and dizziness
- Possible nausea and vomiting

Treatment

Emergency care will include:

- Remove victim from the hot environment

ATTACHMENT A (Page 2 of 6)
HEAT AND COLD STRESS INFORMATION

- Dilute one teaspoon of salt in one quart of water or use a commercial product with a low glucose content; allow victim to sip this solution at the rate of one-half glassful every 15 minutes
- To relieve pain, gently stretch the involved muscle group; gently massage cramps as long as it does not increase the pain or discomfort

The victim should avoid exertion of any kind for 12 hours. A victim of heat cramps is prone to recurrence.

Heat Exhaustion

Symptoms

Heat exhaustion is the most common heat injury and usually occurs in an individual who is involved with heavy physical exertion in a hot, humid environment, and is wearing protective clothing. Heat exhaustion is a mild state of physical shock caused by the pooling of blood in the vessels just below the skin, causing blood to flow away from the major organs of the body. Due to prolonged and profuse sweating, the body also loses large amounts of salt and water. The symptoms of heat exhaustion include:

- Profuse sweating
- Pale, cool, sweaty skin
- Headache and extreme weakness, fatigue
- Nausea and possible vomiting
- Dizziness and faintness
- Collapse and possible brief unconsciousness
- Body core temperature normal, may even be slightly below normal

Treatment

Emergency care will include:

- Remove victim from the hot environment and out of the exclusion zone
- Lie victim down with feet slightly raised
- Remove as much clothing as reasonable (especially personal protective clothing); loosen what cannot be removed
- Apply cold, wet compresses to the skin; fanning will also aid in cooling
- If the victim is fully alert, allow him/her to drink water or the same solution, at the same rate, that was used for the emergency care of heat cramps
- If the victim vomits, do not give fluids by mouth, transport him/her to a hospital immediately (dehydration is the most critical problem in heat exhaustion victim, intravenous fluids will have to be given)
- Take oral temperature every 10 minutes, if the victim's temperature is above 101° or shows a steady increase, transport to a hospital immediately and start sponging him/her off with cool water

ATTACHMENT A (Page 3 of 6)
HEAT AND COLD STRESS INFORMATION

Heat Stroke

Heat stroke is a true life-threatening emergency having a mortality rate of 20 to 70 percent. This condition results when the heat regulating mechanisms of the body break down and fail to cool the body sufficiently. The body temperature rises to between 105 and 110 F; no sweating occurs in about 50 percent of the victims. Because no cooling takes place, the body stores increasingly more heat, and eventually brain cells are damaged, causing permanent disability or death. About 4,000 Americans die of heat stroke annually.

There are two basic kinds of heat stroke: classic heat stroke and exertional heat stroke. Classic heat stroke, in which people lose the ability to sweat, generally affects the elderly or chronically ill. Exertional heat stroke, in which victims retain the ability to sweat, is accompanied by physical exertion and muscle stress. Exertional heat stroke is the type that will be most commonly encountered on a field operation requiring strenuous physical activity. The symptoms of heat stroke include:

- Oral temperature of 105 F or higher
- Hot, reddish skin, skin is usually dry
- Headache
- Dry mouth
- Shortness of breath
- Nausea or vomiting
- Increasing dizziness and weakness
- Mental confusion and anxiety; victims may show unusual irritability, aggression, combative agitation, or hysterical behavior
- Convulsions, sudden collapse and possible unconsciousness; all heat stroke victims having varying levels of consciousness, ranging from disorientation to coma

Treatment

Emergency care will include:

- Remove the victim from the hot environment and from the exclusion zone
- Call for trained emergency medical personnel immediately
- Remove as much clothing as reasonable (especially personal protective clothing); cut clothing with bandage scissors, if necessary, being careful not to injure victim
- Pour cool water over the victim, avoiding his nose and mouth
- Fan the victim
- Place cold packs under the arms and against neck and ankles
- Wrap victim in a wet blanket
- Continue a combination of these methods until the oral temperature falls below 103 F (take measures to prevent chilling, if necessary, i.e., use slower cooling if the victim starts shivering)
- Elevate the head and shoulders slightly during cooling
- Never give the victim anything to drink unless fully conscious and vomiting is unlikely
- Because heat stroke involves the entire body, a number of complications may result
- Brain swelling, convulsions, coma, kidney failure, liver failure, high blood pressure and heart failure.

ATTACHMENT A (Page 4 of 6)
HEAT AND COLD STRESS INFORMATION

Therefore, always transport the victim to a hospital even if the body core temperature has lowered to near normal.

The two most reliable and distinct differences between heat stroke and heat exhaustion are.

Heat Stroke

- Skin flushed (red); may be dry; hot to touch
- Oral temperature above 105°F.

Heat Exhaustion

- Skin pale; wet or clammy; cool to touch
- Oral temperature usually normal.

Cold Stress

Hypothermia is a drop in the core body temperature below 98.6 F. The first symptoms of hypothermia are uncontrollable shivering and the sensation of cold; this is followed by a slowed and sometimes irregular heart beat, a weakened pulse and a drop in blood pressure. Vague or slow slurred speech, memory lapses, apathy, incoherence and drowsiness can occur. Other symptoms may include cool skin, slow, irregular breathing, apparent exhaustion, and fatigue after rest.

Prevention

Hypothermia is caused by prolonged exposure to a cold environment, whether air, water, or snow and ice. Adequate dry clothing with appropriate insulating capacity must be provided to workers to prevent hypothermia, especially if work is performed in air temperatures below 40 F. Wind chill is a critical factor. Work at a slow but steady pace. The job should be a "no sweat" operation.

Unless there are unusual or extenuating circumstances, cold injury to other than the extremities (hands, feet, and head) is not likely to occur without the development of the initial signs of hypothermia. Older workers or workers with circulatory problems require special precautionary protection against hypothermia. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered for these workers. The precautionary actions to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

Treatment

First aid for mild hypothermia will be performed as follows:

1. End the exposure - get the victim out of the cold and wet.
2. Replace wet clothing with dry or add insulation to clothing.
3. Offer warm, non-alcoholic fluids.

ATTACHMENT A (Page 5 of 6)
HEAT AND COLD STRESS INFORMATION

4. Increase exercise.
5. Seek shelter from wind, wet and cold.

CAUTION: If the victim remains cold for a number of hours, chemical changes may have taken place which, on rewarming, may cause major medical problems for the victim and which could result in death. Severely hypothermic victims are best warmed in the hospital under controlled conditions. If a severely hypothermic victim cannot be transported to a hospital within a few hours, rewarming should begin in the field.

Symptoms

Frostbite can occur either before or after the onset of hypothermia when body tissue (usually an extremity) is exposed to freezing temperatures. Frostbite occurs when the fluids surrounding tissue cells freezes. The danger of frostbite increases with increased wind chill and/or reduced temperatures below 32 F. Frostbite can also occur if tissues are in prolonged contact with a frozen material or object. Skin contact with frozen metal, for example, can result in frostbite in a short period of time, even in a warm environment.

There are three degrees of frostbite:

- First degree - freezing without blistering or peeling, "frostnip"
- Second degree - freezing with blistering and/or peeling, and
- Third degree - freezing resulting in the death of skin tissue and possibly the death of underlying tissues as well

Symptoms of frostbite include the following:

- The skin changes color to white or grayish-yellow, progresses to reddish-violet, and finally turns black as the tissue dies
- Pain may be felt at first, but subsides
- Blisters may appear, and
- The affected area is cold and numb

Prevention

Frostbite can be prevented by wearing sufficient protection to prevent skin from coming into prolonged contact with a freezing environment. The following steps can be taken:

1. Wear sufficient clothing. Mittens are better than gloves. Face masks and wool stocking caps are better than hats. Wind and waterproof hoods protect the face and neck.
2. Clothing should be loose enough to prevent constriction of blood vessels. Boots must be roomy enough to permit movement of the toes with no feeling of tightness.
3. Do not contact conductive metals or contact gasoline or other solvents with bare skin as rapid evaporation of solvents may quickly lead to frozen tissues in a cold environment.
4. Exercise the toes and fingers to maintain circulation.

ATTACHMENT A (Page 6 of 6)
HEAT AND COLD STRESS INFORMATION

5. Observe the condition of your partners' face, hands and ears frequently for signs of frostbite
6. Avoid smoking and drinking alcoholic beverages.

Treatment

First aid for superficial (first degree) frostbite is as follows:

1. Place a warm body part next to the frozen area, applying firm, steady pressure.
2. DO NOT RUB THE AREA. Rubbing may cause further damage to already injured skin.
3. Protect the area from further freezing.

First aid for deep frostbite (second and third degree) is as follows:

1. KEEP THE FROZEN PART FROZEN!
2. Prevent further injury: avoid rubbing and further freezing of unaffected tissue.
3. If the part has thawed, the part should NOT be allowed to refreeze or bear weight. A victim with thawed feet should be carried out.
4. Give the victim plenty of fluids and evacuate to medical assistance as soon as possible

Symptoms

This condition may be caused by long, continuous exposure to cold without freezing, combined with persistent dampness or actual immersion in water. Edema (swelling), tingling, itching, and severe pain occur, and may be followed by blistering, death of skin tissue, and ulceration. When other areas of the body are affected besides the feet, the condition is known as chilblains.

Prevention

Trenchfoot and chilblains can be prevented by keeping the body as dry as possible at all times. Waterproof boots should be worn when required, but provisions must be made for preventing excessive perspiration to accumulate inside the boots. Socks should be changed at least twice daily and the boots wiped dry inside with each change of socks. The feet should also be wiped dry and foot powder applied.

Treatment

Affected body parts should not be rubbed or massaged, but bathed in water using plain white soap. Dry thoroughly and elevate the body part, allowing the body part to be exposed at room temperatures. If the feet are affected, do not walk during treatment.

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WORK/REST REGIMENS AND MONITORING



FOSTER WHEELER ENVIRONMENTAL CORPORATION

**HEAT STRESS
WORK/REST REGIMES AND MONITORING**

Introduction

Establishing a work/rest regimen that allows work to be completed in a timely manner while providing adequate rest time to prevent heat stress requires involvement of the ESS, FOL, and individuals involved. In many cases, particularly when wearing normal field type clothing (i.e., level D), awareness and communication are the key elements to a successful program. Allowing rest periods on an "as needed" basis while ensuring vigilance for initial symptoms of heat stress, encourages this success.

There are times when this approach is not appropriate. When heat stress contributing protective clothing (e.g., respirators, impermeable coveralls) are worn for extended periods, or when "as needed" work/rest regimens adversely impact either the individuals exposed to the heat source or work completion, a more formal work/rest regimen will be established.

Formal work/rest regimens are based either on 1) monitoring ambient conditions (e.g., with a WBGT), estimating work loads and establishing work/rest times, 2) monitoring physiological conditions and adjusting work/rest periods, or 3) using personnel heat stress monitors

The WBGT, physiological monitors, and personnel heat stress monitors will be used in accordance with manufacturer's instructions. Personnel heat stress monitors will be approved for use by the PESM.

II. WBGT Based Work/Rest Regimens

A. Work/Rest Regimens

When required, the WBGT will be used in conjunction with the work load to determine the appropriate work/rest regimen for personnel wearing regular work clothing or semipermeable disposal coveralls (uncoated Tyvek). Light work examples include sitting or standing or performing light hand or arm work. Moderate work includes walking about with moderate lifting and pushing. Heavy work corresponds to pick and shovel-type work.

The work/rest regimen using the WBGT procedure will be used as a guideline. Table B-1 outlines the work/rest regimen guidelines based upon WBGT temperature and work load. Table B-2 identifies the correction factors. The WBGT temperature will be determined in accordance with Section B of this attachment.

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WORK/REST REGIMENS AND MONITORING

Table B-1. Examples of Permissible Heat Exposure Threshold Limit Values
(Values are given in °F WGBT)*

Work - Rest Regimen	Light	Work Load Moderate	Heavy
Continuous work	86	80	77
75% Work - 25% Rest, each hour	87	82	78
50% Work - 50% Rest, each hour	89	85	82
25% Work - 75% Rest, each hour	90	88	86

* Notes on Table B-1

- 1) These values are for fully acclimatized workers wearing light weight pants and shirts. For conditions other than this use this table with the correction factors from Table B-2.
- 2) These values assume that workers drink frequently and have properly increased salting of food prior to exposure.
- 3) These values are guidelines. Actual levels may be modified based on individual physiological response and actual work and rest conditions.
- 4) These values assume that the rest location is cool enough to alleviate heat load conditions.

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WORK/REST REGIMENS AND MONITORING

Table B-2. Correction Factors for Table B-1 in °F*

Clothing Type	WBGT Correction
Summer work uniform	0
Cotton overalls	-3.5
Winter work uniform	-7
Water barrier, permeable	-11
Condition	WBGT Correction
	-4.5

Unacclimatized worker, moderate work load

*To use this table, identify the most restrictive applicable clothing type and whether unacclimatized workers are involved. Add the two. Modify Table B-1 temperatures by this amount. For example, the Table B-1 TLV for continuous work, light workload is 86°F. If cotton overalls (-3.5) are worn and acclimatized workers are acclimatized (no additional change) the modified limit is 82.5°F.

B. WBGT Determination

If the Wet Bulb Globe Temperature (WBGT) is used to determine if field conditions are conducive to heat stress illnesses, the WBGT is determined through the following equations.

Outdoors with solar load: (1)

$$WBGT = 0.7 \text{ NWB} + 0.2 \text{ GT} + 0.1 \text{ DB}$$

Indoors or outdoors with no solar load: (2)

$$WBGT = 0.7 \text{ NWB} + 0.3 \text{ GT}$$

Where:

WBGT = Wet Bulb Globe Temperature Index

NWB = Natural Wet-Bulb Temperature

DB = Dry-Bulb Temperature

GT = Globe Thermometer Temperature

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WORK/REST REGIMENS AND MONITORING

The factors involved in the above equations can be measured in the following manner:

- Through the use of a direct-reading heat stress monitor capable of measuring all of the individual factors associated with the WBGT equation. For example, the Reuter-Stokes Wibet No. RSS-214 heat stress monitor.
- By measuring the individual factors manually using the following type of equipment

Natural Wet-Bulb Temperature Thermometer
Dry-Bulb Temperature Thermometer
Globe Temperature Thermometer
Stand

III. Adjusted Temperature Based Work/Rest Regimens

When wearing impermeable protective clothing, the use of work/rest regimens based on WBGT is not recommended. The WBGT index is designed to account for the effects of evaporative cooling. Vapor barrier clothing impedes the evaporation of sweat and renders the WBGT an inappropriate physiological model. The most important environmental conditions related to heat stress for workers wearing impermeable protective clothing have been suggested to be the ambient dry bulb temperature and the radiant solar heat. These factors are combined into an index called the adjusted temperature using the following formula:

$$T^{\circ} \text{ adjusted} = \text{ambient dry bulb temperature} + (13 \times \% \text{ sunshine})$$

where % sunshine is an estimate of the amount of time the sun is covered by clouds thick enough to produce a shadow. The thermometer bulb should be shielded from radiant heat when taking measurements.

The adjusted temperature values are then used to determine the initial work/rest regimen and physiological monitoring frequency. Table B-3 gives the work period and monitoring frequency. Initially, rest periods will be at least 15 minutes. Physiological monitoring that is normally recommended is pulse rate and body temperature. Procedures for each are described below. Initially, both should be done. Pulse rate monitoring may be discontinued with the approval of the PESM if temperature monitoring proves to be effective.

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WORK/REST REGIMENS AND MONITORING

A. Pulse Rate Monitoring

Take the pulse immediately at the start of the rest period (P1). Take the pulse again 2 1/2 to 3 minutes into the rest period (P2). If any of the following conditions exist, shorten the next work period by a third:

P1 > 110 beats per minute(bpm)

P2 > 90 bpm

P1 - P2 < 10^obpm.

Pulse rates can be taken with an electronic pulse meter, or manually with a stopwatch for 30 seconds.

B. Oral Temperature

Take the oral temperature immediately at the start of the rest period. If the oral temperature exceeds 99.5^o shorten the next work period by a third. Do not return the worker to hot work in semipermeable or impermeable clothing until the oral temperature is less than 99.5^oF.

Oral temperatures may be taken with disposable oral thermometers or infrared ear drum scanners, such as the Thermoscan. Note: If a Thermoscan unit is purchased, the Pro Model should be selected. The home model available through drugstores cannot be recalibrated

C. Removal from Exposure

If an individual requires a shortening of the work period on more than two consecutive monitoring periods, or repeatedly over a few days, they should be removed from exposure to hot environments wearing semipermeable impermeable protective clothing until examined and cleared for such work by the consulting physician.

Table B-3. Initial Work Period and Physiological Monitoring Frequency ¹

ADJUSTED TEMPERATURES	SCHEDULE
90° F or above	15 minutes
87.5° - 90° F	30 minutes
82.5° - 87.5° F	60 minutes
77.5° - 82.5° F	90 minutes
70° - 77.5° F	120 minutes

¹ Schedule is for fit and acclimatized workers in impermeable protective clothing.